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REVIEW OF THE IMPLEMENTATION OF THE RECOMMENDATIONS AND DECISIONS ADOPTED BY THE GENERAL ASSEMBLY AT ITS TENTH SPECIAL SESSION

United Nations Institute for Disarmament Research

Economic aspects of disarmament: disarmament as an investment process

Note by the Secretary-General

1. In its resolution 45/62 G of 4 December 1990, the General Assembly requested the United Nations Institute for Disarmament Research (UNIDIR) to prepare, with the assistance of independent experts, a research report on the economic aspects of disarmament and to report to the General Assembly, through the Secretary-General, at its forty-seventh session.

2. Pursuant to that resolution, the Secretary-General has the honour to transmit to the General Assembly the research report of UNIDIR on the economic aspects of disarmament: disarmament as an investment process.

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* A/47/150.

ANNEX

Economic aspects of disarmament: disarmament as an investment process

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LETTER OF TRANSMITTAL

24 June 1992

Sir,

I have the honour to submit to you herewith the research report on the economic aspects of disarmament which UNIDIR was requested to prepare under paragraph 7 of General Assembly resolution 45/62 G of 4 December 1990. Under that paragraph, the General Assembly:

> "Requests the Institute to prepare, with the assistance of independent experts, a research report on the economic aspects of disarmament and to report to the General Assembly, through the Secretary-General, at its forty-fourth session ...".

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Professor Keith Hartley of the University of York, United Kingdom, was designated as the senior consultant for the preparation of this report.

The present report was prepared between January 1991 and July 1992. During that period, UNIDIR held two meetings at Geneva, which were attended by the senior consultant and the members of the group of experts. The first meeting was held from 17 to 19 June 1991 and the second from 13 to 17 April 1992.

The first meeting used a research outline prepared by UNIDIR to define the main points to be dealt with and prepare a plan of work for the report. The experts then transmitted drafts on those points, which served as a basis for the consultant's preparation of a preliminary draft report. That text was then considered and discussed at the second meeting. The consultant then prepared a revised draft, which was submitted to the experts for their comments. The final report was then completed. It was drafted by the consultant but reflects the consensus position of all the members of the group.

The present report begins with an executive summary setting forth the "Economic principles for disarmament" that sum up the main conclusions of the research. It is then divided into three parts. Part One is an overview of the problem and considers in particular defence spending and disarmament. Part Two deals with key issues such as basic data, the economic approach of the defence sector, military research and development, arms transfers, arms limitation, development and economic adjustment and conversion problems. Part Three presents the conclusions of the study particularly on the issue of the "peace dividend" and the role of public policies designed to optimize it.

UNIDIR is an autonomous body of the United Nations established by the General Assembly to carry out independent research on disarmament and related security issues. The consultant and the experts worked in their personal capacity. The Institute takes no position on the views and conclusions expressed.

UNIDIR would like to express its gratitude to the consultant, Professor Keith Hartley, and to all the experts for their work. The research work was coordinated by Serge Sur, Deputy Director, who was assisted by Chantal de Jonge Oudraat, Research Associate. Sophie Daniel acted as secretary to the group during the preparation of the report.

Jayantha DHANAPALA
Director

EXECUTIVE SUMMARY

Economic principles for disarmament

PRINCIPLE I

Disarmament has major economic consequences involving costs as well as benefits. On the cost side, it requires a fundamental reallocation of resources from military to civilian production. This is likely to result in major potential problems of unemployment or underemployment of labour, capital, and other resources in the process of disarmament. As a result, the economic dividends of disarmament are likely to be small in the short term. Ultimately, however, in the long term, disarmament leads to significant and worthwhile benefits through the production of civil goods and services as resources are reallocated to the civilian sector. Thus, in its economic aspects disarmament is like an investment process involving short-run costs and long-run benefits.

PRINCIPLE II

Reductions in military expenditure and disarmament can only become an operational concept if the countries concerned feel that their national security and national economies are not threatened by the process.

PRINCIPLE III

In order to maximize the social rate of return from disarmament, treated as an investment process, reductions of military spending should be gradual and predictable, allowing for smooth economic and social adjustments to decreasing defence expenditures.

PRINCIPLE IV

Overcoming the economic, technological and environmental constraints on conversion requires financial commitments, managerial innovations, manpower retraining, capital retooling and other initiatives so as to minimize the costs and maximize the benefits of disarmament. In addition, the physical conversion of defence plants and equipment can be difficult and costly. As a result, sometimes it is better simply to abandon specialist defence plants.

PRINCIPLE V

There should be explicit recognition of the unprecedented economic problems of disarmament in the current world situation. Disarmament is occurring without a prior major war. At the same time, in several countries, disarmament is occurring simultaneously with a shift from a centrally planned to a market economy.

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PRINCIPLE VI

Methods exist for evaluating the economic problems of disarmament. These include the cost-benefit analysis of impending arms reductions; links between arms reductions and the economic situation nationally and internationally; and the exchange of relevant information and experience on conversion.

PRINCIPLE VII

When assessing the economic aspects of disarmament, a distinction needs to be made between stock conversion and expenditure flow diversion. For some countries, disarmament has implications mainly for their production capabilities and military capital stocks, whereas, for other countries, disarmament has the greatest impact on expenditure flows.

PRINCIPLE VIII

Since Governments provide defence expenditure they need to be involved in the adjustment process. Public policies which assist change and resource allocation can help to minimize the costs of disarmament. Examples include manpower policies which provide information on alternative employment opportunities and assistance for retraining and mobility; and incentives for creating new civil industries and for undertaking civil scientific and technological projects in areas such as energy, the environment and space exploration.

PRINCIPLE IX

Military research and development promotes a growth in the cost of defence equipment and creates pressures for increased defence spending. It generates technological expectations that promote large-scale investments which in turn create rigidities resisting reductions in military expenditure. Thus, disarmament requires control of military technology, especially military research and development. Real disarmament preventing future rearmament requires control of military development work (i.e., development, testing and evaluation).

PRINCIPLE X

Increasing transparency of information regarding arms imports and arms exports is essential. In this context, the Register of Conventional Arms is a welcome development, as are the meetings of the five permanent members of the Security Council on arms transfers and non-proliferation. The responsibility of many countries for limiting arms exports should be emphasized. Steps should be taken at regional and international levels to ensure that disarmament does not lead to arms exports replacing domestic sales.

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PRINCIPLE XI

Industrialized countries might use some of the benefits from disarmament to assist the developing countries. Also, the developing countries might be encouraged to reduce their defence spending.

PRINCIPLE XII

The access to and the use of foreign experience and knowledge in the development of civilian production is a key factor for successful conversion for all countries, especially in countries where the civilian sector of the economy has been neglected and suppressed by military priorities and claims. Joint conversion projects should be recognized as an important aspect of international economic cooperation.

Part One. Overview

I. INTRODUCTION

A. Changes in the world political scene

1. There have been dramatic changes in the last few years, especially in Europe. The end of the East-West cold war arms race has raised the prospect of genuine disarmament associated with sizeable arms reductions. These developments have coincided with a general improvement of the international climate, creating new opportunities for the peaceful settlement of regional conflicts. The role of the United Nations in these endeavours has also been reinforced. Disarmament has until now been restricted to the confines of the former East-West conflict and has been largely concentrated in Europe. The dismemberment of the former Soviet Union has complicated the implementation of recently concluded arms limitation agreements, such as the Treaty on Conventional Armed Forces in Europe (CFE) and the Treaty on the Reduction and Limitation of Strategic Offensive Arms (START) even though voluntary unilateral cuts and the continuation of negotiations have, to some extent, counterbalanced these impediments and possibly created a new disarmament dynamic. There are now real prospects of a disarmament race as States and their electorates seek the benefits of the "peace dividend".

2. Real disarmament offers a range of opportunities. Disarmament is likely to reinforce peace, and peace itself is one of the first dividends of peace. In addition, resources released from defence will eventually become available for alternative uses elsewhere in economies (the concept of opportunity cost). There is no shortage of alternative uses. Nations need to alleviate poverty and have increasing demands for health, education and housing. The problems of hunger and poverty are especially severe in the developing countries of the world. Elsewhere, there are pressing needs to protect and improve the environment, to solve drug abuse, and to eradicate some of the major health hazards, such as cancer and AIDS. However, it would be misleading to suggest that disarmament alone will solve all the world's problems. It can help, but there are no free lunches or magic wand solutions. It has also to be recognized that this is a controversial field, dominated by myths, emotion and ideology, often lacking in economic analysis, critical content and supporting evidence. Where appropriate, the report describes different perspectives and presents an overall evaluation.

3. Disarmament can be viewed as an investment process involving short-run costs in return for longer-run benefits. It requires resources to be reallocated from the armed forces and defence industries to civilian activities and this reallocation process is neither costless nor instantaneous. The process of disarmament creates potential problems of unemployment and under-employment of labour and other resources, particularly in regions which have been dependent on military spending. Highly specialized defence plants and facilities might not have any alternative civil uses. Manpower released by the armed forces and defence firms might need retraining

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and relocating. In some instances, groups and local communities highly dependent on defence spending will oppose disarmament. And the economies of Eastern Europe and the former Union of Soviet Socialist Republics (USSR) face real difficulties in simultaneously disarming and shifting to a market economy.

4. Converting from defence to civil activities takes time and involves costs. Conversion can be treated at two different levels. The uninformed level is the journalistic or "man in the street" level, where conversion is treated like shifting money from one pocket to another. At this level, less expenditure on arms automatically means more funds are immediately available for other non-defence uses. By contrast, the informed level is the analytical or economic level, which recognizes the complexities of resource allocation and the problems involved in reallocating resources from military to civilian uses. These resources include labour, capital, management, energy, and material and service inputs in the production process. The real question here is whether it is possible to reallocate resources from military to civilian industry so as to avoid major long-term structural unemployment, declines in output, and economic, political and social instability.

B. Future prospects

5. Viewed as an investment, disarmament offers opportunities and challenges. Not all investments are successful: some fail. If disarmament involves high conversion costs and lengthy adjustment periods associated with high unemployment, and leads to relatively low benefits, then society's rate of return from disarmament will be low or even negative. Alternatively, if disarmament occurs in an expanding economy with increasing demands for labour and appropriate government manpower policies (e.g., retraining; mobility), there are likely to be low adjustment costs, rapid transition and high conversion benefits resulting in a high return to disarmament. These alternative scenarios need to be applied to three different areas of the world: first, the industrialized market economies of North America and Western Europe; second, the former socialist economies of Eastern Europe and the former USSR; and third, the developing countries.

6. While disarmament is now at the forefront of the international agenda, it has to be recognized that the future is characterized by uncertainty. The future is unknown and unknowable and the prospect of a disarmament race could so easily be replaced by a new arms race. There could, for example, be a breakup of the Commonwealth of Independent States, with each republic moving towards complete independence, with further economic collapse in response to efforts to introduce a market economy, with civil unrest and military confrontations and the possible emergence of non-democratic rule. The ending of East-West tensions has also coincided with nationalist pressures, ethnic tensions, and instability in other parts of the world, such as the Middle East and Yugoslavia. There is no shortage of challenges for the international community to seek to ensure that the world becomes a safer place for all peoples, so offering a real prospect of a substantial peace dividend.

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C. Scope of the research

7. The Expert Group was required to:

(a) Develop methodologies for analysing the economic impacts of disarmament;

(b) Forecast the economic effects of disarmament;

(c) Evaluate in this respect public policies related to disarmament and its adjustment problems.

8. In its deliberations, the Expert Group was asked to consider the following questions:

(a) What would be the effects of particular disarmament measures on the military budgets of the States concerned?

(b) What would be the consequences for the structure of military expenditure?

(c) What would be the costs of destroying, transforming or converting the relevant arms?

(d) What would be the impact on civil and military industries?

(e) Which part of national budgets and national economic activity for military purposes could be reoriented to which type of activity?

(f) What would be the consequences for international trade, especially for the transfers of sensitive technology?

(g) What would be the impact on the development of particular States, notably developing countries?

9. The Expert Group was also required to consider the costs of disarmament at three different economic levels:

(a) At the microeconomic level of the firm and industry in terms of employment and research and development;

(b) At the macroeconomic level of the region and country in terms of unemployment, inflation and the balance of payments;

(c) At the international level in terms of trade, capital movements, and development assistance.

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D. Plan of the report

10. The report is divided into three parts:

(a) Part one presents an overview of the field, especially the issue of whether defence spending is a burden or a benefit.

(b) Part two deals with seven key issues concerned with the scale of the problem (data), the defence sector, military research and development, arms exports, arms limitation, development, together with economic adjustment and conversion.

(c) Part three presents the conclusions of the study, namely, the peace dividend and the role of public policies.

The appendix describes the new discipline of defence economics and contains some suggestions for a research agenda. The bibliography lists data sources and selected references illustrating the range of perspectives in the field.

II. DEFENCE SPENDING AND DISARMAMENT: BURDENS AND BENEFITS

A. Introduction

11. Since defence spending is a major user of scarce resources, economists cannot avoid raising questions about the appropriate size of a nation's defence budget: the classic "guns versus butter" question. Related questions arise whether too much or too little is being spent on defence and whether military expenditures are a burden or a benefit. In this chapter, the economic approach to defence spending and disarmament is reviewed. Disarmament is defined, the debate about the burdens and benefits of both defence spending and disarmament is outlined, and then the contribution of economics to the debate is considered.

B. Disarmament: matters of definition

12. Disarmament can involve one of more of the following:

(a) Reductions in military expenditure due to unilateral initiatives or to bilateral and/or multilateral agreements;

(b) The reduction or destruction of specific weapons (nuclear, chemical etc.);

(c) A ban or limitation on the production of certain types of military equipment;

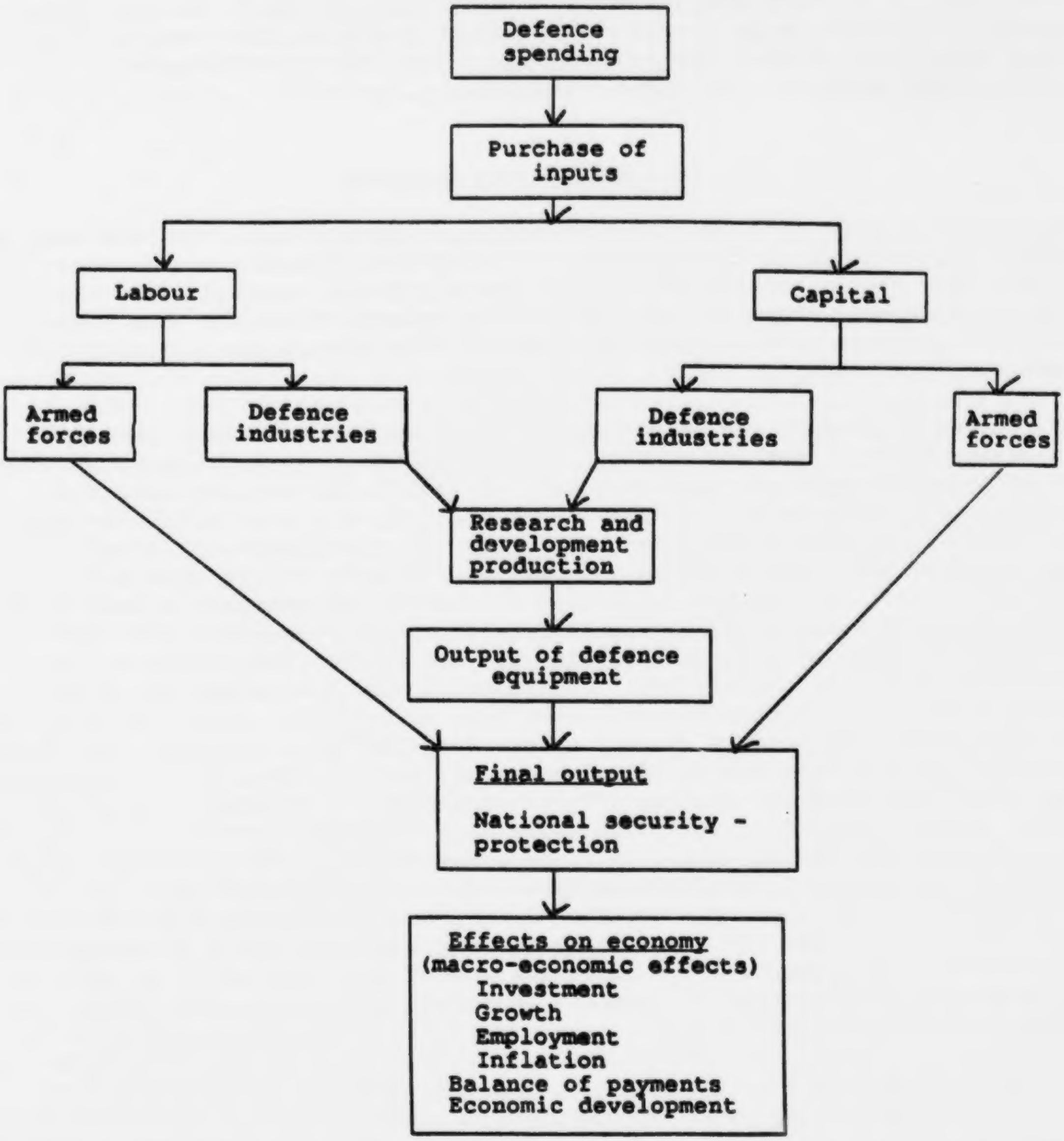
(d) Controls on defence research and development for military purposes;

(e) Limitations on arms transfers;

(f) A monitoring and verification process.

13. A schematic diagram showing the effects of defence spending is presented in figure I. This shows the interrelationships between defence spending, the purchase of inputs of labour and capital (equipment), as well as other inputs of energy, materials, services and management, the resulting outputs of the defence industries and the armed forces and the consequent macroeconomic impacts. It shows how cuts in defence spending would impact on both capital and labour and how disarmament could be targeted at other elements of the military production function. For example, cuts in military spending will reduce the demand for manpower in both the armed forces and the defence industries. On the capital side, some defence bases and facilities will be closed as well as some factories and plants in defence manufacturing industries. Elsewhere, the ways in which the inputs of labour and capital are assembled to produce an output in the form of defence shows that disarmament might focus on other elements in the production process (the military production function) such as defence research and development or the types of military equipment acquired by the armed forces or limitations on the numbers of forces personnel.

Figure I. The effects of defence spending



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14. Throughout the analysis, though, the possibilities and opportunities for substitution should not be ignored. A ban on one class of weapon might lead to an expansion of other weapons not subject to regulation. Similarly, reductions in defence spending might lead nations to substitute one type of weapon for another or to change their defence posture. For example, States might substitute nuclear for conventional forces or replace expensive professional soldiers with cheap conscripts.

C. Burdens and benefits

15. Critics claim that defence spending is a waste of resources and that it crowds out valuable civil investment, with adverse effects on an economy's growth rate and on its international competitiveness. According to this view, "strong defences" might actually weaken the economy which they are supposed to protect. However, not everyone accepts the view that military spending is necessarily a burden.

16. Defence spending can be viewed, from one perspective, as a form of insurance policy. Nations require military expenditures to respond to actual or perceived threats to their national interests. Threats can reflect a struggle for power or for resources such as land, minerals or oil, or they can reflect differences in ideology or religion, or any kind of difference perceived as weakening a nation's security. Defence, though, has a unique feature in that two nations in an arms race might not succeed in increasing their national security by increasing their military expenditures. This is in contrast to the benefits which result when two nations each increase their education or health expenditure. Additional economic benefits are also claimed for military expenditure in the form of training, jobs, the promotion of high technology activities, and spin-off to the civil economy. But these benefits are not free gifts. Civil goods and services have to be sacrificed and there are potential adverse effects on a nation's economic growth and international competitiveness. To quote Paul Kennedy's influential study on the rise and decline of nations "... by going to war or by devoting a large share of the nation's manufacturing power to the expenditures upon unproductive armaments, one runs the risk of eroding the national economic base vis-a-vis states which are concentrating a greater share of their income upon productive investment for long-term growth" (Kennedy, 1988, p. 697; for an annotated bibliography of relevant literature see Hartley and Hooper, 1990b, references 736-932).*

17. From some of the perspectives on military spending, it follows that disarmament leading to lower defence budgets would require a reduction in the actual or potential current or future threats to national security (i.e., a more peaceful world scenario). The resulting economic benefits of disarmament

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* For complete references, see the bibliography at the end of this report.

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would be reflected in the release and reallocation of resources from military to civil uses and possibly favourable effects on growth and international competitiveness. There could, though, be some adverse effects if, as is sometimes argued, defence spending promotes technical advance. Moreover, reallocating expenditure and resources away from the defence sector takes time and there are costs involved in adjusting to change. What contribution can economists make to understanding the economic problems of disarmament?

D. The contribution of economics

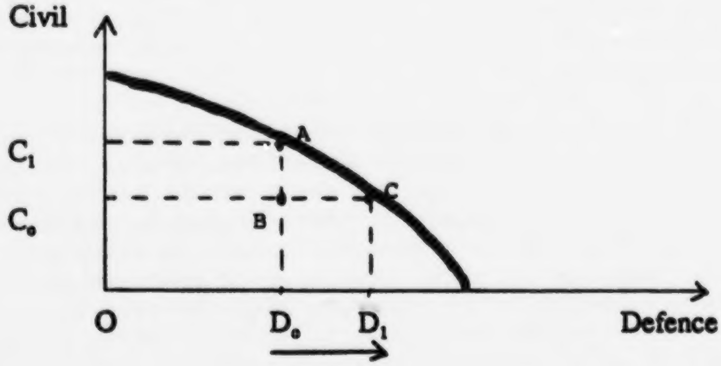
18. Interest by economists in the burdens and benefits of defence spending and in disarmament is not new. Some of the early economists addressed issues of the "proper" role of the State, the economic causes of war and the short-term and long-term impacts of military expenditure. Some Marxists also argued that military expenditure is necessary for the maintenance of capitalism as a viable economic system (Smith, 1977; Smith and Smith, 1983). Today, there is a considerable literature on the macroeconomic aspects of military spending, especially whether it represents a burden or benefit to developed or developing countries (e.g., Benoit, 1973; Russett, 1970; De Grasse, 1983; Kaldor *et al*., 1986; Kennedy, 1988; Gold and Adams, 1990). Extensive studies have also been undertaken into the arms race (Richardson, 1960; Isard, 1988; Intriligator, 1990) and into peace, disarmament and conversion (Melman, 1962; Dunne and Smith, 1984; Southwood, 1991). Work in microeconomics has embraced studies of procurement policy, the military-industrial complex, the defence industrial base and case studies of industries and projects (Hitch and McKean, 1960; Hartley and Hooper, 1990b, references 440-660).

19. Often the starting-point in analysing defence, disarmament and peace issues has been standard macro- and microeconomics, usually Keynesian and neo-classical economics. Keynesians focus on defence spending as a component of aggregate effective demand. With unemployment in an economy, higher military spending adds to aggregate demand and leads to a greater national output and higher employment. However, if the economy is already at full employment, higher military spending might be inflationary, or could be associated with balance of payments problems (Smith and Smith, 1983). Similarly, if an economy is already in recession with large-scale unemployment, then disarmament leading to sudden, large reductions in military spending without any compensating increases in aggregate demand will add to the unemployment problem. In contrast, reduced defence spending in conditions of economic expansion and tight labour markets might provide the additional resources needed for sustained economic growth. This suggests that to minimize the dislocations and unemployment effects of disarmament, there might need to be compensating aggregate demand policies with reductions in defence spending which are gradual and predictable.

20. Neo-classical economics focuses on opportunity costs and market adjustments. Opportunity costs reflect the fact that resources are scarce and their use in one activity, such as defence, means that they cannot be used for

something else, for example, education or health. A classic example is the "guns versus butter" trade-off, shown in figure II. Assuming an economy's resources are fully and efficiently employed, then an increase in defence spending from D_0 to D_1 involves a sacrifice of C_1 to C_0 of civil goods and services, such as schools, hospitals, housing etc. In addition, neo-classical economists use demand and supply analysis to assess the impact of changing demands between military and civil goods by focusing on the changes in prices and quantities in product and labour markets. In these simple models, prices are assumed to clear all markets leaving neither shortages nor surpluses of labour, capital, and goods and services. However, market adjustments are not always smooth and instantaneous: we do not live in a world of magic wand economics. Adjusting to change takes time and is likely to involve costs as reflected in dislocations, unemployment and the underemployment of labour, capital and other resources. An example is shown in figure II. Disarmament involving a reduction in defence spending from D_1 to D_0 will eventually be associated with a greater output of civil goods and services. But as the economy moves from position C to position A it is likely to proceed via point B which will be associated with unemployment. The likelihood that disarmament involves costs as well as benefits suggests that it should be regarded as an investment process.

Figure II. Guns versus butter



E. Disarmament as an investment process

21. Investment involves current sacrifices in return for expected future benefits and society would regard an investment as worthwhile if the future benefits exceeded the current costs. A good example occurs where you plant a seed today and next year you have more than one seed after allowing for all other costs. But since present income is worth more than the same amount in 10 years time (assuming no inflation), all benefits and costs have to be expressed in the same terms: hence they have to be discounted and all expressed in present values.

22. Treating the economic aspects of disarmament as an investment process, there are initial costs due to unemployment and underemployment of the resources used to produce military goods and services (labour, capital, and other resources such as land and energy). This unemployment occurs during the transition period, which may last for years. At issue is whether these unemployed resources can be employed elsewhere and, if so, where, when and how. The costs of conversion can be very substantial and last a long time, involving structural rather than frictional unemployment. Indeed, the groups likely to lose from defence cuts will form major barriers opposing disarmament. Eventually, though, benefits will flow as the inputs released by the armed forces and defence industries are reallocated to the production of civil goods and services. Thus, the peace dividend needs to be regarded as the social rate of return to disarmament after allowing for the costs and the benefits of the investment process. For policy makers, the relevant question is how to maximize the return from disarmament by minimizing unemployment, conversion and reallocation costs, and maximizing the economic benefits of disarmament.

F. Empirical studies

23. Given the variety of economic models offering alternative insights, explanations and predictions, it might be expected that the differences between them could be resolved through empirical studies. Which economic theory is best fitted to understanding and predicting the economic effects of disarmament? Here, there are at least two approaches, namely, qualitative and quantitative.

24. First, historical studies and case studies can provide useful insights. For example, studies of previous experience following defence cuts can identify how well and how quickly economies adjusted to change. Examples include the experience of economies following the end of the First and Second World Wars and of the United States economy following the end of the Korean and Viet Nam wars (Hartley and Hooper, 1990b). Of course, following the end of the Second World War, the United Kingdom economy, for example, was faced with a massive rebuilding programme to restore its damaged infrastructure, so there was no shortage of demand. For United Kingdom defence firms, government orders for, say, housing replaced orders for defence equipment. Similarly, case studies of defence contractors can contribute to an understanding of firm behaviour and the problems of conversion (Southwood, 1991). Some country case studies, such as those of Germany and Japan since 1945, suggest that economic success does not require large military expenditures. However, the cases of Germany and Japan illustrate the temptations of confusing simple correlations with causation. A variety of factors determine economic success with military spending as only one among a number of determinants.

25. Second, various quantitative techniques are available, including input-output analysis, simulation studies and statistical-econometric methods. One major study applied an input-output model to forecast the implications for the world economy by the year 2000 under different

assumptions as to military spending, the arms trade and aid transfers from rich to poor nations (Leontief and Duchin, 1983, p. 66). The results show that with reduced military spending, almost all economies are able to increase total output and per capita consumption. Furthermore, this study predicted that while lower defence expenditures throughout the world accompanied by aid transfers from the rich countries would improve the living standards of the poor nations by the year 2000, the gap in economic well-being between the rich and poor nations would be barely narrowed.

26. Econometric techniques are extremely attractive with their emphasis on elaborate models and quantification. A number of recent examples illustrate some of the findings relevant to this chapter:

(a) An econometric study based on a two-sector production function model (defence and civilian sectors) applied to the United States of America found a positive and significant relationship between defence spending and economic growth; but the findings also showed that the responsiveness of economic growth to changes in defence spending is small. Thus, for the United States, if there are significant cuts in defence spending, the adverse effects on economic growth should not be large (Atesoglu and Mueller, 1990);

(b) A study using a four-sector production function model (the sectors comprising defence, Government, exports and the rest) applied to a group of industrialized countries concluded that the gross effect of military spending on growth is neither significantly positive nor negative, although the defence sector is much less productive than the rest of the economy (Alexander, 1990);

(c) A substantial number of econometric studies confirm an inverse or negative relationship between military expenditure and investment (Smith, 1980);

(d) A study of defence spending and United States economic performance found no substantial relationship, in either causal direction, between defence spending and the price level, the unemployment rate or the interest rate: hence, those arguments which link defence spending to poor economic performance receive little empirical support (Kinsella, 1990);

(e) Evidence from the United Kingdom, the United States and 11 countries members of the Organisation for Economic Cooperation and Development (OECD) does not suggest that the share of military expenditure is a significant influence on the unemployment rate. Thus, in analysing unemployment, no special account needs to be taken of military expenditure (Dunne and Smith, 1990a).

27. Persuasive though econometric results appear, they have their limitations. For example, they might be ad hoc models, lacking a satisfactory theory. Few compare the relative impacts of defence with civil expenditures. Data problems are ignored and much of the empirical work is highly aggregative, ignoring the underlying microeconomic foundations of

macroeconomics; and the results can be conflicting, being sensitive to equation specification, to time periods and to the sample of countries included in the estimation. In the circumstances, it is prudent to adopt a combination of economic theories and methods of testing to obtain satisfactory insights into the economic aspects of defence spending and disarmament (Sur, 1991b).

G. Conclusion: the key issues

28. The economic approach to disarmament suggests a number of relevant economic concepts, which may be summarized as follows:

(a) Opportunity cost (= the alternatives sacrificed);

(b) Cost-benefit analysis;

(c) Disarmament as an investment process;

(d) The production functions (= the use of inputs to produce outputs).

In evaluating defence and disarmament issues, economists have to distinguish myths and ideology from propositions which have some foundation in economic theory and which can be formulated into testable hypotheses. Economists can apply simple concepts of opportunity cost to assess critically assertions about, say, the jobs and technology benefits of defence spending. In such cases, they need to ask whether the resources currently employed in defence industries would make a greater contribution to employment and technology objectives (if these are society's objectives) if they were used elsewhere in the economy.

29. There are numerous studies of the macroeconomic impact of defence spending in both industrialized and developing countries (see bibliography). There is, though, a noticeable absence of good economic studies of disarmament. It is to be hoped that the situation will change as debates about the peace dividend focus public attention on the economic potential and problems associated with disarmament. As a contribution to the debate, part two of this study focuses on the key issues.

Part Two - Key issues

III. THE SCALE OF THE PROBLEM

A. Introduction: the need for data

30. What is known, what is not known and what do we need to know for sensible debates and public choices on the economic aspects of defence and disarmament? Data are a starting-point. We need to know the scale of the problem. Good quality and comprehensive data are needed to estimate the economic costs and benefits of disarmament. If detailed data on a country, industry or region are not available, it is not possible to assess whether or not disarmament will be economically beneficial. Some of the statements in this report about costs and benefits are inevitably vague because of data problems, particularly in developing countries.

31. A starting-point in assessing the scale of the problem is to determine how much is spent on defence by different countries throughout the world, both industrialized and developing. This allows an assessment of its opportunity costs or sacrifices of alternatives such as social welfare spending (education, health, housing), consumption and investment goods. Accurate data are also central to debates about the arms trade, the arms race, arms control and disarmament. Reliable data enable nations to monitor the international trade in arms, so identifying the major exporters and importers and the potential for regional arms races and regional conflicts. The arms trade with Iraq prior to the 1991 conflict in the Persian Gulf is a good example of both the potential and limitations of data. Between 1986 and 1990, Iraq was the world's fourth leading arms importer, its major suppliers being the former USSR, France and China. However, Iraq also illustrates the limitations of data, as reflected in attempts to thwart arms embargoes and to develop secret domestic nuclear and chemical weapons industries.

B. Data problems

32. Inevitably, secrecy and a concern with national security affects the quality and quantity of data which are publicly available on defence spending. Even in open and democratic societies, nations have a variety of techniques for concealing sensitive data, for example, on nuclear programmes. Information on new defence research and development programmes can be "hidden" in the general defence budget or allocated to other civil research and development projects, or it might be concealed for reasons of "commercial sensitivity". In this context, data on the costs of defence equipment can be especially difficult to obtain. States are often reluctant to publish data identifying research and development costs, unit production costs, operating costs, and the quantities purchased. In some cases, total programme costs of equipment might be published, without any definition of what constitutes the programme or any data on the size of the production order.

33. States also adopt different definitions of defence spending. Some might include expenditure on pensions for retired armed forces personnel and on the civilian police force; and there are questions about classifying civil research and development with military applications and military personnel undertaking civilian jobs paid for by civil ministries. There are also different definitions of what constitutes defence procurement. In addition to expenditure on research and development and production, procurement might be defined to include spending on one or all of construction, infrastructure, operations and maintenance. Even within equipment, a distinction might be made between warlike and non-warlike, the former comprising arms, munitions and war material, such as missiles and tanks, and the latter including foodstuffs, clothing and motor cars. Such definitional problems are not trivial. Are heavily armed and specialist police forces to count as soldiers; is a commercial airliner a potential military transport aircraft; and is an oil tanker readily available as an aircraft carrier for vertical take-off fighter aircraft? Similarly, parts of the immense infrastructure required by modern weapons systems might not be totally classified as pure military expenditure or hardware. A good example is the complex system of radio-communications installations required for the positioning of strategic nuclear submarines, namely, the Loran C and Omega system. Some of these installations were not classified as military expenditures: hence the most visible part of the entire system, the strategic nuclear submarines, were only the tip of the iceberg.

34. Even where data are publicly available, their limitations need to be recognized. Data on the number of armed forces personnel are of limited use without information on their training and efficiency and the quantity and quality of their equipment. Similarly, a concern with military expenditure only measures inputs and not final outputs in the form of protection and national security. And in the case of the arms trade, it is not sufficient to focus on the trade in major weapons. Information is needed on the trade in small arms, which can be major elements in local conflicts and minor wars.

C. Data availability: what is known

35. Despite the problems, data are available to provide a broad indication of the world's defence spending,the size of armed forces and the arms trade. The sources of published data are described in the bibliography.

36. Defence spending consumes large quantities of the world's scarce resources. In 1990, world military expenditure was estimated at some $950 billion with almost 85 per cent undertaken in the industrialized countries (table 1) and some 60 per cent of the world total reflecting the cold war in Europe. By the late 1980s, world military expenditure had started to decline, mainly reflecting reductions in spending in the United States and the former USSR. However, these reductions need to be seen against the massive increases which occurred in the United States and former USSR defence spending in the 1980s (Arms Control and Disarmament Agency (ACDA), 1990; Stockholm International Peace Research Institute (SIPRI), 1991).

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Table 1. World military spending and armed forces 1990

A. Spending

(billions of United States dollars)

Industrialized countries (including Eastern Europe)	
United States and USSR	560
EEC	167
Total industrialized countries	800
Third world	150
Total	950

B. Defence as share of GDP, 1980-1989

(percentage)

Western industrialized countries	4
Third world	5
Average for world	4.9

C. Manpower: armed forces a/

(thousands)

Industrialized countries	10 040
Developing countries	18 250
Total	28 290

Sources: Stockholm International Peace Research Institute (SIPRI), 1991; Arms Control and Disarmament Agency (ACDA), 1990.

a/ Armed forces data are for 1989.

37. Defence spending in the third world also rose rapidly during the 1970s and into the early 1980s. This increase reflected the demands of newly-emerging States for independent armed forces, regional conflicts, including a major war between Iraq and Iran from 1980 to 1988, military

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dictatorships and the Middle East oil boom. By the mid-1980s, a distinct downward trend had emerged in the aggregate military spending of developing countries, although there are substantial regional variations. By 1990, the developing countries accounted for an estimated 16 per cent of world military expenditure, but some 65 per cent of the world's military manpower. In addition, their average defence burden as a share of national output was higher than the share in the industrialized nations. Not surprisingly, with such defence burdens there have been various proposals for the developing countries to reduce their military spending and to use the resources released to assist their economic development (UNDP, 1992).

38. It cannot be assumed that current downward trends in world military spending will continue. The future is uncertain and major political developments in various regions of the world, such as the Middle East, the former USSR and Yugoslavia, could easily generate new and dangerous arms races and conflict situations. Moreover, defence research and development is continuously developing new and costlier weapons which the armed forces will require in order to maintain their operational effectiveness. For example, the B-2 stealth bomber is estimated to cost $35 billion for 15 aircraft (United States Senate hearings, 1990). Such high technology equipment absorbs scarce scientists and technologists in the development process and requires skilled military manpower for its operation and maintenance. Reliable data are difficult to obtain, but estimates suggest that in 1990 military research and development employed some 750,000 to 1.5 million scientists and engineers throughout the world, mostly in the United States and the former USSR (these two countries plus China, France, Germany and the United Kingdom account for over 90 per cent of world military research and development: Thee, 1990).

39. In addition to data on defence spending, another relevant economic indicator is provided by data on the international trade in arms. Since difficulties arise in valuing such international transactions (e.g., barter, gifts, subsidies, black markets), they are useful only as indicators of broad trends. The world trade in arms is substantial, estimated at some $45 billion, as shown in table 2. In 1989 developing countries accounted for 76 per cent of the total, which was a reduction from its 1979 share of 84 per cent. The Middle East continues to be the world's major market for arms but the most significant change has been South Asia's rise from one of the smallest arms-importing regions in 1979 to the second largest in 1989. Arms imports, especially for developing countries, absorb scarce foreign exchange which has other uses (thus involving opportunity costs); they can add to the balance-of-payments problems and the associated need for costly adjustment measures to correct such problems; they can lead to increased military spending in operations and support; and they might lead to pressure to create a domestic defence industrial base.

40. The industrialized countries dominate the world's arms exports, accounting for 90 per cent of the total export trade in 1989, developing countries accounting for the remaining 10 per cent. In 1989, the former USSR and the United States were the world's leading arms exporters, followed by the United Kingdom, France, China and Germany (ACDA, 1990).

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Table 2. The arms trade, 1989

Total value of arms imports	(billions of US dollars)
Industrialized countries	10.7
Developing countries	34.6
Total	45.3
Main importers	**Share of total** (percentage)
Middle East	26.6
South Asia	17.4
NATO Europe	14
East Asia	11.8
Africa	8.8
Warsaw Pact	7
Latin America	5.6
Other regions	8.6
Main exporters	
Former USSR	43.1
United States of America	24.7
United Kingdom	6.6
France	5.9
China	4.4
Other NATO	4.3
Other Warsaw Pact	4.2
Other developing countries	3.7
Others	3.1

Source: ACDA, 1990.

41. In addition to national data, further data are available at the company level. The Stockholm International Peace Research Institute produces a list of the 100 largest arms-producing companies in the OECD and third world countries (see chap. IV). In the late 1980s, United States firms accounted for 9 of the top 10 and 14 of the top 20 arms-producing companies. Within the top 100, about 12 per cent were highly dependent on defence, which accounted for 90 per cent or more of their sales (e.g., Northrop and Newport News, United States; DCN and GIAT, France; Ordnance Factories and Hindustan Aeronautics, India; however, these figures exclude companies in the former USSR, the other former Warsaw Pact countries and China).

D. Data needs: some proposals

42. Reasonably comprehensive data and data evaluations are available on world military expenditure and, to a lesser extent, on the arms trade. But expenditures are used to purchase real resources of labour, capital, energy and other inputs, all of which form the defence sector. Good quality data are lacking on the net output, total employment, including research and development staff, and the capital stock of the world's arms industries. Similarly, little is known about the capital stock of the world's armed forces (e.g., military bases and facilities: see chaps. IV and V). Nor are comprehensive data available on the geographical and regional distribution of defence industries and armed forces. Which regional economies in which countries are dependent on defence spending and hence vulnerable to cuts in military expenditure?

43. Data are needed for an informed debate on defence spending and disarmament. They are also needed for policy formulation; for monitoring the potential for arms races and regional conflicts; and for assessing progress on the costs and benefits of disarmament. The recent United Nations initiative creating a Register of Conventional Arms is a welcome development (see General Assembly resolution 46/36 L). The Register requires Member States to provide data on international arms transfers for various categories of weapons, as well as information on their military holdings, and procurement through national production. Such a Register could form the basis for creating a more comprehensive data bank identifying the location, the major inputs into, and outputs from, the world's defence sector. Reliable estimates are needed of the labour and capital resources required by industries and companies developing and producing defence equipment and the resulting output for domestic and export sales. Estimates are also needed of the skill mix or human capital of employment in defence industries and the armed forces.

44. New policy concerns and initiatives will create demands for new data. For instance, a growing concern with human rights issues requires data on internal security expenditures, for example, paramilitary and police forces. Monitoring progress on the benefits of disarmament requires information on who gains from the reductions in military spending. Within central government expenditure do health, education and social expenditures benefit or are the released resources allocated to policing and internal security? In fact, the fungibility of the released resources makes it difficult or impossible to determine which sectors really benefit. While greater transparency will help, it is, of course, recognized that some States might fail to comply or might cheat, and that information only provides the basis for the informed debate needed to make sensible public choices.

IV. THE DEFENCE SECTOR

A. Introduction: the policy issues

45. Disarmament as an investment process involves adjustment costs in return for expected future benefits. The process of adjusting to lower defence spending takes time: change is not instantaneous and costless. Those groups, towns and regions dependent on defence spending will bear the costs of adjustment. These include personnel in the armed forces, in defence ministries, in military research and development establishments and in defence industries (sometimes known as the military-industrial complex). The towns and regions in which military bases and defence industries are located will bear substantial costs, particularly where communities depend upon defence spending as the major source of employment. For example, defence spending can provide jobs directly as well as indirectly in supplier networks and also through the multiplier effects of local spending resulting from the defence jobs. The closed military cities in the former USSR are a good example of localities dependent on defence spending.

46. Groups likely to lose from disarmament will obviously oppose reduced defence spending. Such opposition presents a challenge to Governments to inform and educate these groups and society of the long-run benefits of disarmament: in the long run everyone could benefit. At the same time, Governments have to recognize that for disarmament to be socially beneficial, the potential benefits must exceed the likely costs. This probably requires that those bearing the costs of adjustment receive some assistance in adjusting to change, the aim being to minimize the costs and maximize the benefits of disarmament (e.g., via measures on labour mobility and the retraining of managers and workers: see chap. XI).

47. As a starting-point in identifying the groups likely to bear the costs of disarmament, it is necessary to identify the scale of the problem. How much employment is created by the armed forces and by defence industries throughout the world; how important is the defence sector as a user of capital (e.g., military bases' manufacturing plants), land, technology and other inputs; which are the major defence companies and how dependent are they on arms sales? Questions also arise about the regional distribution and location of the defence sector. Here, it is necessary to know not only the country location of the defence sector but its regional distribution within a country.

48. As always in this field, there are the inevitable data problems, limitations and secrecy. While there are data on armed forces personnel, there are not always data on the numbers of civilians employed to support military manpower; and, of course, nations differ in their "mix" of conscript and volunteer forces. The size and location of military bases and facilities is often secret. Similarly, for defence industries it is not always obvious whether the numbers employed include indirect employment (i.e., among subcontractors and suppliers) and the employment created by the multiplier effects of additional consumer spending generated by the defence jobs. All too often the focus is on the large prime contractors to the relative neglect

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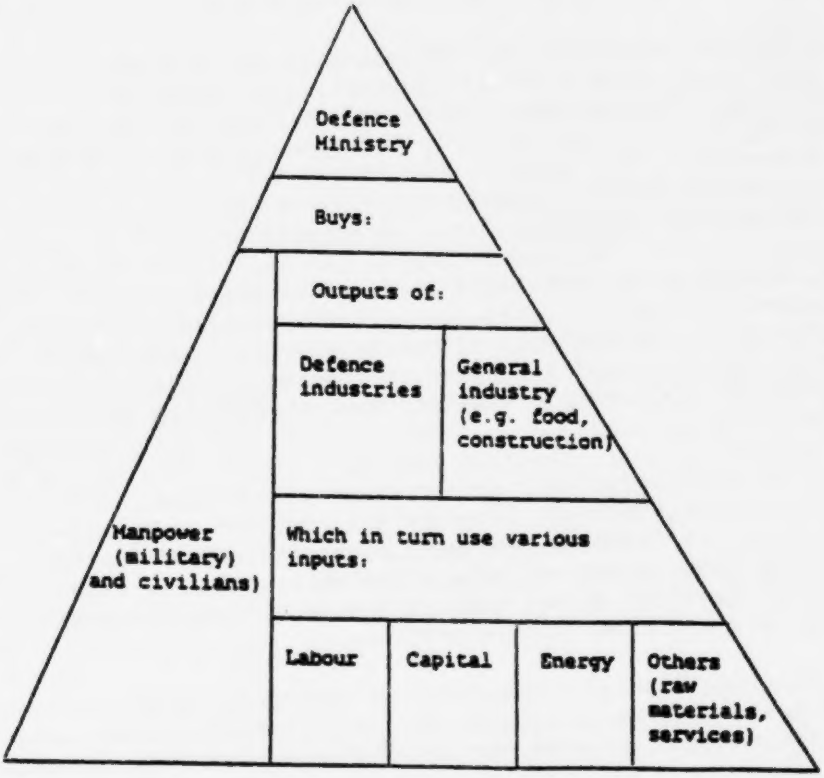
of the suppliers, many of whom will be variously dependent on defence business, geographically dispersed and sometimes the only or major employer in a local community. Nor is it always possible to obtain accurate information on a firm's dependence on defence sales and the location of defence dependent plants. Some of the economic characteristics of defence markets are outlined in this chapter; a broad overview of employment in the armed forces, in defence industries, the major arms producers and their dependence on defence is then presented.

B. Economics of defence markets

49. Defence markets involve buyers and sellers. Typically, a national Government represented by its defence ministry purchases manpower, equipment and facilities to enable its armed forces to provide national protection and security. Manpower is purchased directly in the form of military personnel and the civilians required to support the armed forces and indirectly through the labour required for supplying defence equipment and facilities, such as military bases. A simple scheme is shown in figure III.

Figure III. Defence markets


Defence Ministry
Buys:
Outputs of:
Defence industries
General industry (e.g. food, construction)
Manpower (military) and civilians)
Which in turn use various inputs:
Labour
Capital
Energy
Others (raw materials, services)

50. There are, though, some distinctive features of defence markets that are relevant to understanding their operation, namely the role of Government and the characteristics of the weapons acquisition process:

(a) Governments are central to understanding defence markets. They can determine whether to purchase military manpower on the open market (an all-volunteer force) or to use conscription (compulsory military service for all or most citizens). As a single buyer or monopsonist, a Government determines technical progress through its choice of equipment and it can choose to import equipment or buy from its domestic industry. Also, as the sole or major buyer of, for example, combat aircraft, missiles, submarines, tanks and warships, a Government can determine the size of its domestic defence industry, its structure, entry and exit, ownership, prices, profits, efficiency and export sales. Not surprisingly, such purchasing power is often used as an instrument of industrial and technology policy designed to achieve wider economic and social objectives concerned with employment, the balance of payments and growth.

(b) The weapons acquisition process involves Governments buying defence equipment either from foreign suppliers (arms transfers), or from their domestic defence industrial base. The usual characteristics of the process are:

(i) Government protection for their national defence industries;

(ii) Often defence industries are dominated by one firm (monopoly) or a few relatively large firms (oligopoly), some of which are state-owned. Such market structures are found in the high technology sectors, particularly aerospace, radar, torpedoes, tanks and submarines. For example, the United States aerospace industry is a privately-owned oligopoly while the French helicopter industry is a state-owned monopoly (i.e., Aerospatiale);

(iii) Firms often receive cost-based contracts awarded on a non-competitive basis. This is a situation where a monopsony bargains with a monopoly or oligopoly supplier. In such situations, price is the result of a complex bargaining process reflecting economic and non-economic factors (e.g., bargaining skill, threats and bluff);

(iv) Subsidies, state ownership and government regulation of profits on defence contracts provide firms with incentives to pursue non-profit objectives. For example, managers might be satisfied with a quiet life; they might hoard valuable scientists; and they might prefer managerial benefits in the form of luxury offices, expense accounts, company cars and other fringe benefits.

51. The result of such a market environment is costly equipment, characterized by cost overruns, delays in delivery, "gold plating" and cancellations. For example, on some complex projects, development costs might

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be at least twice their original estimate (in constant prices), the project might be delayed for several years and some of the performance characteristics might reflect a desire by the defence contractor to maximize technical sophistication ("gold plating") regardless of the cost-effectiveness of the equipment. It is an environment in which Governments and contractors are frequently criticized for managerial incompetence, waste, fraud, inefficiency and excessive profits (Hartley, 1991; Peck and Scherer, 1962; Hartley and Hooper, 1990b, references 440-566). It is also an environment which has been described as the military-industrial complex (Galbraith, 1967; Pursell, 1972). This complex comprises the defence ministries, including the armed forces, the political-institutional structure and defence contractors, including the linkages between these interest groups and their common concern with maintaining defence expenditure.

C. Military manpower

52. Data on the size of almost every country's armed forces are readily available, but no comparable statistics exist for employment in defence industries. As a broad order of magnitude, total worldwide military-related employment has been estimated at 60-80 million people (see A/43/368). Within this total, the world's armed forces accounted for some 28 million; and before the 1990 Treaty on Conventional Armed Forces in Europe, a substantial proportion were based in Europe, including foreign troop deployments (Renner, 1991). Of course, within each country, certain towns and regions are highly dependent on employment created, and spending generated, by local defence facilities such as naval bases, army garrisons and training bases and air force bases, some of which are located in remote rural areas with few alternative employment prospects.

53. Table 3 presents data on military manpower in some of the leading countries and an estimate for the world in the region of 50 million people. These figures should be regarded as approximations and broad orders of magnitude. In some countries, there are definitional problems where internal police forces are highly trained and heavily armed and hence close substitutes for military personnel; and following the 1990 CFE Treaty and events in Eastern Europe and the former USSR, the numbers of military personnel in the States members of the North Atlantic Treaty Organization (NATO) and the former Warsaw Pact countries are likely to decline substantially. In countries and regions where foreign troops have been deployed, such as Germany and Eastern Europe, their withdrawal will result in an initial net loss of spending power and hence employment. At the same time, foreign troops returning to their native countries will initially contribute additional injections of spending power into those countries. At the same time, reabsorbing returning forces into the home economy will create problems of job creation, housing and social services.

54. Interestingly, table 3 has two distinctive features: first, in the late 1980s, the relative concentration of total military-related employment in China, the former USSR, the United States and India, amounting to almost

half of the world total; second, the substantial number of developing countries which were in the 20 highest-ranking countries, mostly due to the size of their armed forces. For such countries, defence industry employment is relatively small since many rely heavily on imported weapons.

Table 3. Total employment: armed forces and defence industries

Twenty highest-ranking countries	Armed forces	Defence industry (thousands)	Total
China	3 783	5 000	8 783
USSR	3 993	4 400	8 393
United States	2 246	3 350	5 596
India	1 362	280	1 642
France	550	400	950
United Kingdom	324	620	944
Democratic People's Republic of Korea	842	55	897
Turkey	847	40	887
Poland	430	272	702
Germany a/	495	191	685
Republic of Korea	626	30	656
Egypt	452	100	552
Pakistan	484	40	524
Italy	390	103	493
Taiwan, province of China	390	50	440
Brazil	319	75	394
Spain	304	66	370
Czechoslovakia	211	125	336
Indonesia	284	26	310
Israel	191	90	281
Total 40 countries	20 555	15 889	36 444
World total	28 400	21 950 b/	50 350 b/

Source: Renner, 1991, p. 15.

Note: Data are for selected years in the late 1980s. Other countries in the 40 include most of the remaining members of NATO and the former Warsaw Pact, plus Argentina, Chile, Malaysia, Peru, Singapore and Thailand.

a/ The Federal Republic of Germany before reunification.

b/ For defence industry, and total, world figures are estimates extrapolated from ratios.

D. Arms production

55. Table 3 also presents estimates of total employment in defence industries in the leading countries and for the world. Once again, the figures need to be treated with caution. There are major comparability problems, particularly in relation to whether the estimates include indirect as well as direct employment. However, it can be seen that in the late 1980s, some 80 per cent of the world's total defence industry employment was located in three States, namely, China, the former USSR and the United States.

56. The 1990 CFE Treaty will have a major impact on equipment holdings by the armed forces of NATO and the former Warsaw Pact and hence on the future market prospects for defence industries in the member States. Estimates suggest cuts in arms sales (both domestic and export sales) by Western Europe's arms industries of at least 15 per cent and possibly as high as 30 per cent by 1995. Such cuts might mean the loss of between 300,000 and 500,000 jobs between 1990 and 1995. Shipyards and producers of land systems are especially vulnerable, while high technology sectors might actually benefit (e.g., electronics: Anthony *et al*., 1990). Details of the 1990 CFE Treaty are summarized in table 4. Since the adoption of that Treaty, voluntary unilateral cuts by individual countries, especially the former USSR and the United States, will perhaps have even greater impacts on the level of defence spending. Indeed, it is possible that a disarmament race might replace the cold war arms race between the big Powers.

Table 4. Treaty on Conventional Arms in Europe, 1990

Equipment	Maximum holdings for each group of States	Maximum holdings for any individual State	Actual declared holdings: NATO	Actual declared holdings: Former Warsaw Pact
Tanks	20 000	13 300	24 366	31 713
Artillery pieces	20 000	13 700	20 744	24 745
Armoured combat vehicles	30 000	20 000	34 225	41 832
Combat aircraft	6 800	5 150	5 646	8 427
Attack helicopters	2 000	1 500	1 594	1 662

Source: United Kingdom, Cmnd. 1559, 1991.

57. A survey of the top 100 arms producers in the OECD and third world countries showed that in 1989, almost 50 per cent were in the United States, and a further 33 per cent were in France, Germany, Italy and the United Kingdom. In comparison, among the top 100, there were only two firms from

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India and one from the Republic of Korea. Within the top 100, United States companies accounted for over 60 per cent of arms sales, Western European for some 30 per cent and the developing countries for about 2 per cent (excluding the former USSR, Warsaw Pact countries and China: SIPRI, 1991).

58. Table 5 shows the top 10 firms together with the largest arms producers in each country among the top 100 in 1989. It will be seen that aircraft, electronics and missiles are strongly represented and that the firms differ in their dependence on defence sales.

59. In relation to disarmament, the defence firms which are likely to encounter the greatest adjustment problems are those wholly or largely dependent on defence sales. Table 6 identifies the firms in the top 100 in the OECD and third world countries which depend on defence for 90 per cent or more of their business (see also chap. IX). Two points emerge. First, aerospace and shipbuilding are defence dependent sectors, particularly in France, the United Kingdom and the United States. Second, only 13 per cent of the top 100 are defence dependent (90-100 per cent defence sales), with a total employment exceeding 210,000. This figure is surprisingly small. However, it excludes defence dependent firms in the rest of the world, especially in China, the former USSR and in the former Warsaw Pact States.

60. In many countries, defence industries are concentrated in one or a few regions. European examples include Ile de France (Paris), Acquitaine and Provence in France; the South East and South West in the United Kingdom; Munich, Bremen, Baden-Württemberg, Hamburg and Kiel in western Germany; Lombardia, Campania, Liguria and Lazio in Italy; and Wallonia in Belgium (Renner, 1991). United States examples include Connecticut, Massachusetts (Boston), Missouri (St. Louis), southern California, Texas (Dallas) and Virginia (Newport News). However, whether a region will be severely affected by disarmament depends upon the diversity of its economic activity and the range of alternative employment prospects (i.e., its absolute versus its relative dependence). Also, the regional distribution of defence facilities, such as bases, needs to be included in any assessment of the geographical distribution of total defence activity. Finally, a broad regional analysis might be too aggregative, thereby failing to identify particular towns and communities which might be highly dependent on defence spending and hence potentially vulnerable to disarmament.

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Table 5. Examples of major arms producers, 1989

Rank a/	Company b/	Industry	Arms sales (millions of US dollars)	Arms sales as a percentage of total sales	Total employment
1	McDonnell Douglas (United States)	Ac, El, Mi	8 500	58	128 000
2	General Dynamics (United States)	Ac, MV, El, Mi, Sh	8 400	84	103 000
3	Lockheed (United States)	Ac	7 350	74	82 500
4	British Aerospace (United Kingdom)	Ac, El, Mi, SA/O	6 300	42	125 600
5	General Electric (United States)	Ac, Eng	6 250	11	292 000
6	General Motors (United States)	Ac, Eng, El, Mi	5 500	4	775 000
7	Raytheon (United States)	El, Mi	5 330	61	77 600
8	Boeing (United States)	Ac, El, Mi	4 800	24	164 500
9	Northrop (United States)	Ac	4 700	90	41 000
10	Rockwell International (United States)	Ac, El, Mi	4 500	36	109 000
12	Thomson SA (France)	El, Mi	4 320	36	100 000
13	Daimler Benz (Germany)	Ac, Eng, MV, Mi, El	4 260	10	368 226
20	Mitsubishi Heavy Industries (Japan)	Ac, Mi, Sh	2 640	17	43 914
23	IRI (Italy)	Ac, Eng, El, Sh	2 230	5	363 449

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Table 5 (continued)

Rank a/	Company b/	Industry	Arms sales (millions of US dollars)	Arms sales as a percentage of total sales	Total employment
36	Ordnance Factories (India)	A, SA/O, Oth	1 330	96	..
37	INI (Spain)	Ac, A, MV, El, Sh, SA/O	1 290	8	149 910
46	Oerlikon-Buhrle (Switzerland)	Ac, A, El, SA/O	1 040	36	27 236
47	Israel Aircraft Industries (Israel)	Ac, El, Mi	1 030	80	16 600
49	Nobel Industries (Sweden)	El, Mi, SA/O	950	27	22 246
56	Philips (Netherlands)	El	800	3	304 800
65	Daewoo (Republic of Korea)	El, Sh	600	3	91 056
98	Armscor (South Africa)	A, Ac, MV, El, SA/O	340	49	19 000

Source: SIPRI, 1991.

A: artillery; Ac: aircraft; El: electronics; Eng: engines; Mi: missiles; MV: military vehicles; SA/0: small arms/ordnance; Sh: ships; Oth: others.

a/ Rank is based on top 100 arms producers in OECD and third world countries (excluding USSR, Warsaw Pact and China).

b/ Table shows largest company in each country listed among the top 100. Total employment is for all the company's activities.

Table 6. Defence dependence, 1989

Rank a/	Company b/	Industry c/	Arms sales (millions of US dollars)	Arms sales as a percentage of total sales	Total employment
9	Northrop (United States)	Ac	4 700	90	41 000
15	Directions des constructions navales (France)	Sh	3 630	100	28 000
27	Newport News (Tenneco, USA)	Sh	1 950	100	28 000
36	Ordnance Factories (India)	A, SA/O, Oth	1 330	96	..
45	Ingals Shipbuilding Litton Industries (United States)	Sh	1 050	100	14 000
48	GIAT (France)	A, MV, SA/O	1 020	97	14 200
54	VSEL (United Kingdom)	Sh, MV	870	99	16 610
54	Bofors (Nobel Industries) (Sweden)	A, El, Mi, SA/O	870	97	7 669
58	Matra (France)	Mi	710	100	..
66	Oto Melara (Italy)	A, MV, Mi	580	100	2 329
68	ER (Switzerland)	Ac, Eng, A, SA/O	550	94	4 248
84	Hindustan Aeronautics (India)	Ac, Mi	440	96	43 403
87	Devonport Management (UK)	Sh	410	98	7 500

(Source and footnotes on following page)

(Source and footnotes to table 6)

Source: SIPRI, 1991.

a/ Rank is based on top 100 arms producers in OECD and third world countries (excluding USSR, Warsaw Pact and China).

b/ Table shows largest company in each country listed among the top 100.

c/ For abbreviations, see notes to table 5.

E. Conclusion

61. This general review has focused on the size and location of the world's defence sector, comprising both armed forces and defence industries. These are the groups that will bear the costs of disarmament. Effectively, these groups represent labour and capital. Labour comprises manpower in the armed forces and defence ministries, and capital includes military bases and facilities, for example, air bases and communications centres, together with the factories and their equipment in the defence industries. Each of these factors of production are likely to encounter different problems in the transition to disarmament (see chap. IX).

V. MILITARY RESEARCH AND DEVELOPMENT

A. Introduction: the key issues

62. Military research and development (R&D) is an important element of national security as well as a determinant of the arms race. It is a major employer of scientific and technical personnel. It leads to new and costlier types of defence equipment which might enhance national protection whilst constituting a threat to other countries, thus promoting further military R&D in the nations which feel threatened and contributing to the arms race. Military R&D contracts also create expectations among defence firms of future production orders, so inducing them to remain in the market. Finally, it is also claimed that military R&D provides valuable "spin-off" to the civil economy and is a major source of a country's technical competitiveness (e.g., through promoting high technology in industries such as aerospace and electronics: Vayrynen, 1992).

63. Military R&D also creates uncertainty for arms limitation agreements. For example, who in 1930 would have predicted that, within 15 years, the United States would have developed and used an atomic bomb while Germany would have developed the first generation of cruise and ballistic missiles (V1 and V2 rockets)? In other words, defence spending and arms limitation agreements are based on current weapons and technology and not on unknown and uncertain future developments. States involved in arms limitation agreements have normally excluded new technologies or weapons systems whose potential has not been fully exploited. There are, though, some exceptions. The 1972 Treaty between the United States and the USSR on the Limitation of Anti-Ballistic Missile Systems (ABM Treaty) explicitly limits one very important part of military R&D, namely the advanced testing of ABM systems. In addition, R&D is often not included in arms limitation agreements because of the difficulties of implementing a reliable verification system. Also, arms limitation agreements might create incentives to develop new weapons not subject to any agreement. Nor should the focus be solely on military R&D. Civil R&D has military applications and the increasing emphasis on dual-use technologies creates further complications for arms limitation negotiations and genuine disarmament.

B. The facts

64. Military R&D is defined as embracing research, development, testing and evaluation. For some equipment, R&D might constitute one third of the total acquisition cost. The continuous search by the armed forces for technical superiority has resulted in costly and ever increasing costs of defence equipment. Development costs on modern defence equipment are substantial and for the four-nation European fighter aircraft are estimated at some £8 billion (1990-1991 prices). The Gulf war of 1991, which demonstrated the superiority of high technology equipment, is likely to increase the demand for defence R&D. Cost increases on defence equipment average about 10 per cent per annum in real terms, which means a doubling in cost every 7.25 years (Pugh, 1986).

Such cost trends have led some commentators to contemplate, mischievously, a future of a one-aircraft air force and a one-ship navy. Simultaneously with limited defence budgets, these cost trends result in smaller, but more expensive, armed forces and in associated changes in the size and structure of the industries that supply equipment: a process which has been described as economic or structural disarmament. Further changes are likely as military R&D occurs in the new international environment following the end of the East-West cold war.

65. The secrecy surrounding military R&D means that it is not possible to obtain an accurate estimate of total world expenditure and its associated inputs of capital (e.g., laboratories and their equipment) and labour, especially of qualified scientists and engineers. None the less, some orders of magnitude are available:

(a) In States such as the United States, the United Kingdom and France, military R&D during the late 1980s represented about 10-12 per cent of total defence spending. For the former USSR, the share was estimated at almost 20 per cent in 1989 and about 11 per cent in 1991 (SIPRI, 1991);

(b) World expenditures on military R&D are concentrated in a few countries. In the late 1980s, the United States and the former USSR accounted for as much as 80 per cent of total world military R&D and the addition of China, France, Germany and the United Kingdom raised the share to over 90 per cent;

(c) In 1985, total military R&D expenditure by the OECD countries was some $40 billion, with 80 per cent undertaken in the United States;

(d) In 1989, the United States spent about two thirds of its Government R&D budget on defence, compared with about half in the United Kingdom, over a third in France, a quarter in Sweden, an eighth in Germany and a tenth in Italy;

(e) In the mid-1980s, of the 5-7 million persons employed in global R&D, about 1.5 million were working in military R&D (Thee, 1990, p. 10).

C. Economic impacts

66. Science and technology are important determinants of a country's international competitiveness. Increasingly, the industrialized countries regard high technology as a means of maintaining a competitive advantage over the newly-industrializing countries. To its supporters, defence R&D is seen as a means of promoting the high technology sectors, such as aerospace, and electronics and of providing valuable spin-off to the civil economy. However, defence R&D employs scarce resources which have alternative uses. Critics claim that defence R&D deprives the civil sector of scarce scientific resources, that the industries and firms dependent on defence work perform badly in world markets and that there is too little spin-off from defence R&D to the rest of the economy. Thus, military R&D has two economic impacts.

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First, it involves a diversion of scarce R&D resources, especially scientific manpower. Second, it has output effects including civilian spin-offs (as well as "spin-ins" from the civil sector). Moreover, these output effects can extend over a number of years, perhaps even decades.

67. To economists, the debate and controversy over defence R&D raises a variety of analytical and empirical questions:

(a) Does defence R&D "crowd out" civil R&D? Why and what is the evidence? And what would be the alternative employment of science and technology inputs (labour and capital) in the case of a reduction in defence budgets?

(b) Does a country's commitment to defence R&D enhance or impair its growth and international competitiveness? For example, are defence-intensive industries and companies experiencing a gain or loss of market share, especially in high technology sectors, such as aerospace and electronics?

(c) Is there spin-off from defence R&D to the civil sector and vice versa; is such spin-off accidental; and how does it compare with any spin-off from civil R&D to other parts of the civilian economy? Where a distinction is made between spin-off as a transfer of technology compared with the transmission of productivity gains, questions arise how military R&D compares with civilian R&D as a generator of productivity gains for the rest of the economy.

D. Defence research and development and crowding-out

68. The crowding-out hypothesis can be summarized as follows:

> "Necessary investment in defence R&D may crowd out valuable investment in the civil sector. While defence R&D has contributed to the advance of technology, a nation's resources of qualified scientists and engineers, and the skilled manpower supporting them, are not inexhaustible. Defence and civil work are in competition for the same skills, and it would be regrettable if defence work became such an irresistible magnet for the manpower available that industry's ability to compete in the international market for civil high technology products became seriously impaired". (United Kingdom, 1987. The question has been adapted and generalized.)

In this form the crowding-out hypothesis has at least two interpretations:

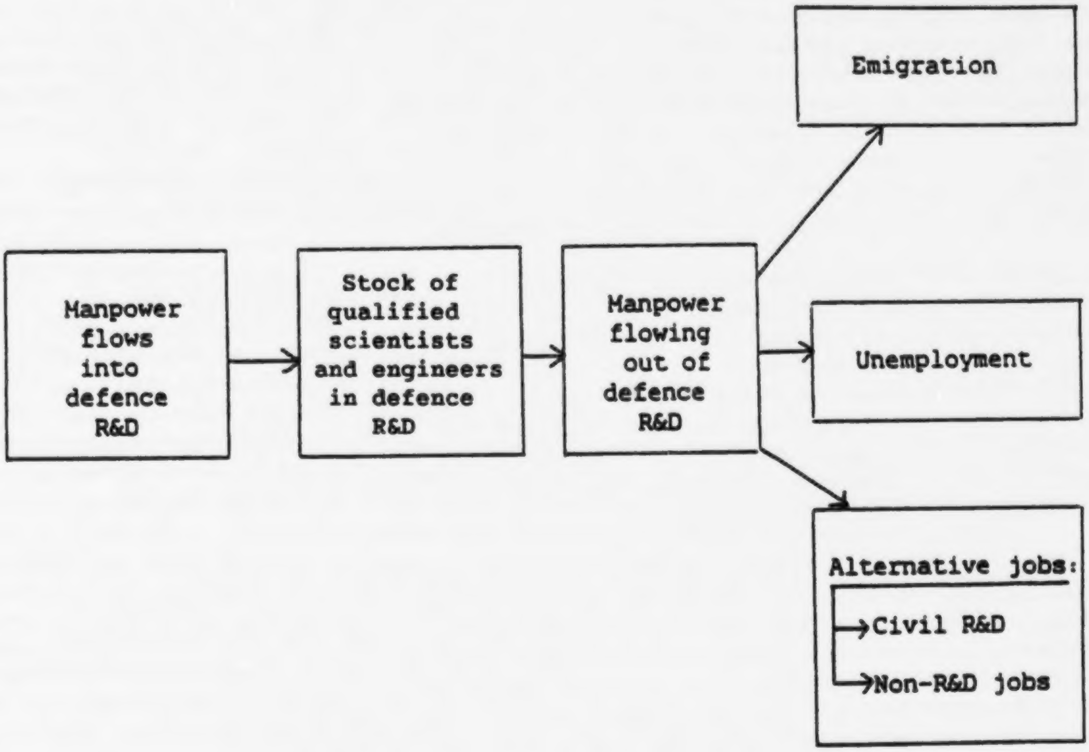
(a) The standard opportunity cost interpretation. In a fully-employed economy, defence R&D is not unique and all choices and expenditure decisions result in some form of crowding-out. The quoted text refers to the crowding-out of valuable investment in the civil sector (does it mean investment or civil R&D?) and suggestions of an inelastic supply of qualified scientists and engineers. In the long run, of course, the supply of qualified scientists and engineers should increase in response to relatively high earnings. Here, it is useful to distinguish between an existing stock of manpower and additional flows which will eventually increase the size of the stock;

(b) The magnet effect attracting scarce manpower with adverse effects on industry's international competitiveness. This suggests not so much a direct crowding-out effect as the belief that defence R&D was acting as a magnet attracting firms, especially in the engineering sector, to safe, protected, cost-plus defence markets. The result is believed to be a harmful externality with defence firms operating in a culture of dependency rather than an enterprise culture, with adverse effects on their international competitiveness (ACOST, 1989; Hutton, 1991). On this interpretation, direct cuts in defence R&D are not the only or necessarily the most appropriate policy solution. A competitive procurement policy will change the traditional "cosy relationship" between the defence ministry and its contractors. Also, planned cuts in defence spending in NATO and the former Warsaw Pact States in the 1990s will have a "shock effect", changing firms expectations about future market prospects and profitability, and forcing them to consider diversifying into civil markets.

69. The direct crowding-out hypothesis raises interesting questions about linkages, the adjustment period and allocative mechanisms through which it is supposed to work. The hypothesis assumes that valuable civil investment is the alternative which is being crowded out by defence R&D. However, at full employment, other activities could be crowded out, namely, private consumption, government expenditure and exports. Of course, if resources are unemployed, there is no crowding-out. Nevertheless, cuts in defence R&D spending will release resources affecting the existing stock of qualified scientists and engineers in defence as well as future flows. Manpower released from defence might become unemployed, or emigrate or find an alternative job as shown in figure IV. What actually happens will depend on the level of aggregate demand and the operation of the market for qualified scientists and engineers. Budget cuts in defence R&D might be compensated by corresponding increases in government-funded civil R&D, or in other government expenditure or, via tax cuts, in private spending. The resulting spending pattern will create a new set of labour market signals. At the same time, the qualified scientists and engineers released from defence will be searching for new jobs. Whether they are successful depends on their access to labour market information, the minimum wage at which they are willing to work, and the transferability or specificity of their skills. Government interpretation of the crowding-out hypothesis often seems to assume excess demand for qualified scientists and engineers in the civil sector and that qualified scientists and engineers in the defence sector possess general skills which have value to large numbers of firms in the economy. It may be, though, that the latter have highly specific skills reflecting the non-commercial nature of military markets. Nor does it follow that all the qualified scientists and engineers released from the defence sector will flow into private sector civil R&D work. Some might enter non-R&D work in the public or private sectors, for example, in management, administration or education. Once there are seen to

be continuing cuts in defence R&D, the sector will appear less attractive for new entrants into the labour market, so changing future flows of qualified scientists and engineers.

Figure IV. Reallocating scientific manpower


Emigration
Manpower flows into defence R&D
Stock of qualified scientists and engineers in defence R&D
Manpower flowing out of defence R&D
Unemployment
Alternative jobs:
Civil R&D
Non-R&D jobs

70. Evidence on the defence R&D crowding-out hypothesis is limited. Some argue that it is impossible to undertake a satisfactory test of the hypothesis. Others suggest that casual empiricism based on the contrasting economic performance of the United States as a high military spender and Japan as a low military spender is persuasive and proves that defence expenditure adversely affects economic performance (Kaldor et al, 1986). In contrast, others state that there is no support for crowding-out. For example, a scatter diagram of United States data did not show an inverse relationship between annual changes in military and civilian R&D expenditures (Weidenbaum, 1990). Such contrasting conclusions show the limitations of simplistic analysis. However, estimating more complex models for a sample of countries showed that defence R&D had positive, negative and insignificant effects on investment (Hartley and Singleton, 1990). Rarely is attention given to the data problems and the difficulties of obtaining a consistent definition and

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measurement of defence R&D to allow satisfactory international comparisons to be undertaken.

E. Growth, competitiveness and industrial performance

71. In Western countries, a high defence R&D burden may appear to be associated with a decline in international competitiveness, as reflected in such indicators as productivity and import penetration in technology intensive industries. The contrasting experience of, on the one hand, the United States and the United Kingdom with high defence R&D burdens and, on the other, Germany and Japan is frequently used to support the argument. Reality, though, is much more complicated than indicated by superficial comparisons which focus on only one (military R&D) among a variety of possible determinants of a country's economic performance.

72. References are often made to the negative impact of military R&D on productivity trends (Vayrynen, 1992). Econometric research on the relationship between industrial R&D and productivity trends has not been able to reach conclusive results. In some studies, a significant positive relationship appears to exist between productivity growth and R&D expenditures, but according to other studies the relation between the two variables is not important. It is therefore not surprising to find that expenditures in military R&D cannot be easily related to trends in the evolution of factor productivity.

73. One other way of examining this relation has relied on highly disaggregated information and on the nature of R&D activities. Process innovations resulting from R&D imply productivity gains for the performing industry. In contrast, product innovations used as inputs of user industries, for example, machine tools, may transmit important productivity gains to industries that are not the performers of R&D. Because military R&D concentrates on product technology for direct use by the military and there are no end-user industries using the resulting product innovations as inputs, it is possible to conclude that military R&D is likely to have a negligible impact in generating productivity gains in user industries.

74. However, empirical work in this and other areas is not without its problems. Correlations are often mistakenly used to suggest causation; other relevant determinants of a country's economic performance might be ignored; and aggregate data might conceal the underlying trends at the disaggregated level. Secrecy is a problem and there are difficulties in defining defence R&D and distinguishing it from non-military R&D and from some production activities, such as start-up costs; and in some cases time-series and cross-section data can give contradictory results. It is also the case that empirical results in this area are subject to the inclusion or exclusion of certain countries (e.g. the United States and Japan as outliers) and to the exact specification of the estimating equation. Finally, there is a need for dynamic models which recognize that the economic impact of current defence R&D will extend over a long time horizon.

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F. Spin-off

75. Historically, defence requirements have been one among a number of important determinants of technical advance, particularly in times of war. After 1945, for example, the military supported new technologies such as radar, electronics, computers and aerospace which had, and continue to have, manifold applications in the civil sector. If there are such valuable spin-offs (beneficial externalities), then concern has been expressed that reductions in defence R&D will have adverse effects on the civil economy and that these adverse effects will extend over many years. Such arguments about valuable spin-off from defence R&D need to be assessed more analytically and critically.

76. By the 1980s, States such as the United States and the United Kingdom were questioning the unidirectional spin-off model. Germany and Japan, with low defence R&D burdens, had emerged as highly successful economies showing major technical advances in the computer and electronics industries. At the same time, in some sectors civil technology had become much more advanced than military technology (e.g., software engineering; semi-conductors); and there is evidence of substantial transfers of technology from the civil to the military sectors (electronics as an example of spin-ins: POST, 1991). It also emerged that some military technologies with demanding performance requirements were becoming highly specific with little or no value to the civil sector; for example, stealth technology is not applicable to civil aircraft, which contrasts with some of the earlier spin-offs from military to civil aircraft. There are also institutional barriers to the transfer of technology from defence to the civil economy often reflecting the different cultures of the two sectors. Within firms, barriers arise where defence contractors have separated their military and civil activities to meet the requirements of military secrecy, government accounting standards, and the exacting requirements of military specifications, or to exploit the benefits of specialization. Between firms, spin-off will depend on the general or specific nature of the technology, property rights and the operation of information markets (POST, 1991).

77. The major problem in evaluating the spin-off argument is the lack of evidence which would allow a proper cost-benefit appraisal. There are persuasive arguments on both sides which need analysis and evidence to reach a conclusion. Most of the evidence is qualitative, anecdotal and based on selected examples of successful or failed spin-off. It is, of course, difficult to quantify and measure the benefits of spin-off. However, frequent assertions that spin-off is difficult to measure may reflect the fact that there is nothing to be measured: some examples may have been exaggerated in favour of military R&D. Moreover, it has to be recognized that investing in military R&D might not be the most efficient way of promoting civil technology: similar State support for private sector civil research could well create more marketable products.

G. Defence research and development, conversion and public policy

78. Cuts in defence budgets might not necessarily result in corresponding cuts in military R&D. Two pressures might protect defence R&D budgets. First, there will be pressure to maintain an advanced defence technology base capable of responding to future threats, for example, via support for technology demonstrators. This might also reflect the high re-entry costs if a country wished to re-create its military R&D sector. Second, military R&D is often viewed as an instrument of industrial policy aimed at promoting high technology sectors, such as aerospace and electronics. Developing countries might use such R&D to promote infant industries and achieve entry into new technologies; while industrialized countries use military R&D to maintain their international competitiveness. Admittedly, there are alternative methods of achieving such objectives: for example, by government funding of space exploration or basic research in the civil sector. None the less, the military R&D complex is likely to constitute a major barrier to cuts in such spending, pointing to the alleged "catastrophic" consequences for a nation's high technology and its ability to "survive" in the modern world economy, competing with the newly-industrializing countries.

79. Defence R&D also has some distinctive features which create difficulties for conversion. In some cases, the assets, qualified scientists and engineers and other staff in the defence R&D sector are highly specialized, defence-specific and hence non-transferable (see also chap. IX). The defence R&D industry focuses on high quality and demanding performance requirements reflected in cost escalation, delays in delivery and "gold plating". Often the result is a culture of dependency with firms dependent on government defence business, rather than an enterprise culture where firms have to take risks in identifying profitable market opportunities. Once again, these problems of conversion and the possible opposition to cuts in defence R&D spending provide an opportunity for Governments to educate society about the long-run benefits of disarmament and to assist military scientists to retrain and to relocate.

80. What are the possible future uses for the major military R&D complexes, particularly those in the United States and the former USSR (e.g., Los Alamos, United States)? The problems of possible future use are particularly important in the former USSR, not so much for economic reasons as for political and strategic reasons. There are a number of possibilities for such complexes:

(a) They could continue undertaking military R&D work;

(b) They could continue to employ their staffs but they would be paid to do nothing;

(c) They could shift their military scientific manpower to foreign countries;

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(d) They could shift their scientific manpower to related civilian R&D and other civil activities. For example, links might be encouraged between military R&D staff, academic research institutes and civilian industry (e.g., teaching; testing of prototypes). Or international collaboration might be developed, undertaking joint research projects in civil technology (e.g., between the United States and former USSR and their weapons laboratories).

81. Some of these future scenarios could add to regional arms races and the potential for regional conflicts (e.g. military scientists moving to foreign countries). Similarly, the option of continuing military R&D work might not be destabilizing if there were less development, testing and evaluation (i.e., if defence research only were continued). However, the possibility of a shift from military to civil R&D is obviously attractive. This might be achieved in various ways, such as through tax incentives, the award of government contracts and through retraining and relocation programmes. In some cases, the appropriate solution might be to close the military R&D complex and assist its staff to retrain and to move to other sectors of the economy. Elsewhere, some military R&D complexes might be reorganized into privately-owned civil R&D firms required to bid for civil work in competitive markets so as to survive. Certainly there is no shortage of high technology problems requiring scientific manpower. There are problems involving the environment, future sources of energy, food production in developing countries, transforming centrally planned economies to market economies and solving the remaining health hazards such as AIDS and cancer: such problems provide opportunities for using R&D resources for the benefit of mankind.

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VI. ARMS EXPORTS

A. Introduction: the key issues

82. Following the Gulf war, there has been renewed interest by the United Nations, the European Community (EC) and other international organizations, such as the International Monetary Fund (IMF) and the World Bank, in monitoring and controlling the international trade in arms. There is a continued concern that arms exports will create regional arms races and increase the possibilities of local and even global conflict. Regions of particular concern include the Middle East, the Persian Gulf, North Africa, the Indian subcontinent, parts of South-East Asia, South and Central America. These regions embrace developing countries faced with massive problems of poverty, starvation, ill-health, homelessness and illiteracy. For such countries, an arms race is especially costly (see chap. VIII). Indeed, proposals have been made that international agencies such as the World Bank and IMF should make payments of aid to developing countries conditional on reductions in their defence spending (McNamara, 1991). Proposals have also been made to limit arms exports to specific regions, such as the Middle East (Conference on Disarmament 1991). A welcome initiative promoting greater transparency is the creation in 1992 of the Register of Conventional Arms which provides data on international arms transfers (General Assembly resolution 46/36 L, annex).

83. There are other features of the international arms trade which cannot be ignored. First, following recent cuts in military spending in NATO and the former Warsaw Pact countries, it is likely that defence contractors will be actively seeking export sales to compensate for declining domestic procurement. As a result, disarmament in one part of the world (NATO and the former Warsaw Pact States) might actually increase armaments and might contribute to instability elsewhere in the world. Second, in the absence of adequate international security arrangements, arms exports and imports might be necessary to ensure that some nations are able to protect themselves. Of course, the difficulty here is that in the absence of an international agreement, arms-supplying countries differ in their views as to which countries are "friendly" and what is the appropriate quantity and quality of arms exports needed to provide "adequate" national protection. Third, arms exports can be an important source of employment to the exporting company and country, so creating an interest group which will oppose controls on foreign arms sales. Further economic benefits to the exporting nation arise where exports enable arms suppliers to spread high fixed research and development costs over a larger output and to obtain economies of scale, leading to lower unit costs. In some defence industries, such as aerospace, these cost savings can be substantial (Hartley, 1991a, chap. 7). Furthermore, economic criteria have increasingly replaced political reasons for arms exports, such as support for allies and friends, especially amongst the newer arms-supplying countries seeking to earn foreign currency. Interestingly, though, it does not always follow that arms-exporting States, as distinct from contractors, always benefit from foreign arms sales. It is not unknown for arms exports to be sold at a loss, or for research and development costs to be waived, and examples have arisen where payment has not been made.

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84. Policy makers seeking to control the international arms trade need to be aware of the problems of definition, the scale of the trade and the difficulties of regulation, particularly given the strong pressures to continue arms production in NATO, the former Warsaw Pact countries and other exporting countries.

B. Definitions

85. The international trade in defence equipment is reflected directly in arms exports and imports. It is also reflected indirectly in international supplier relationships (e.g., United States and European prime contractors purchasing parts and components from, say, Asia and Japan), in technology transfer and in a variety of international linkages reflected in licensing and co-production agreements, collaborative programmes and offsets (Willett, 1991).

86. Traditional international trade theory predicts that international trade will be based on differences in comparative advantage between nations and that competitive market prices will determine the quantity and value of foreign trade. Arms markets depart from this traditional model. Governments control the exports of their defence contractors. They can determine prices by providing subsidies or waiving research and development levies or accepting barter arrangements; they can offer exports as free gifts and they can determine which countries are allowed to receive their arms exports.

87. Data problems abound. International arms agreements are often shrouded in secrecy and there is some illicit or black market trading. Publicly-available data usually refer to complete and major weapons systems, failing to report the trade in parts, components and spares as well as the trade in infrastructure, facilities and support services (e.g., construction of airfields and communications systems; repair and maintenance; training of personnel). Differences also exist between the regularly published data sources. The Stockholm International Peace Research Institute and the United States Arms Control and Disarmament Agency provide regular data on international arms transfers; but the former focuses on major conventional weapons while the latter includes both major weapons and small arms (see A/46/301).

88. It can also be misleading to focus solely on arms transfers. There is a major international trade in civil goods, services, technology and manpower which have potential military applications currently or in the future (dual-use). Examples include the export of powerful computers which could be used to develop advanced weapons systems and precision machine tools which could be used to shape "quiet" submarine propellers. Similarly, the international mobility of scientists can result in the transfer of military technology, for example, nuclear weapons and missile technology, from, say, the former Soviet Union to the Middle East.

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C. The international arms trade

89. The facts of the international arms trade in major conventional weapons are summarized in table 7. According to the SIPRI figures, the main features are:

(a) In 1990, world trade in major conventional weapons totalled some $21.73 billion, compared with almost $40 billion in 1987 (1985 prices: SIPRI, 1991). Part of this decline reflected a massive reduction in imports by Iraq, with further reductions by Egypt, India, Israel and the Syrian Arab Republic. The ACDA figures estimated the total world arms trade (major weapons and small arms) at some $45 billion in 1989 (current prices: ACDA, 1990);

(b) In 1990, third world countries accounted for some 55 per cent of total deliveries. In terms of quantity, arms exports to the third world between 1983 and 1990 were dominated by missiles, armoured vehicles and artillery (Willett, 1991);

(c) The major arms exporters were the former USSR, the United States, France, the United Kingdom and China. Between 1986 and 1990, these States accounted for almost 90 per cent of world arms exports;

(d) Among the second tier arms producers, the major exporters are Czechoslovakia, Brazil, Israel and Spain;

(e) In 1990, the leading arms importers were Saudi Arabia, Japan, India and Afghanistan, accounting for about one third of world arms imports;

(f) Between 1986 and 1990, exports from the former USSR were concentrated on nine countries which accounted for 80 per cent of total Soviet exports, namely, India, Iraq, Afghanistan, the Democratic People's Republic of Korea, the Syrian Arab Republic and Angola in the third world and Poland, Czechoslovakia and the German Democratic Republic in the former Warsaw Pact. The 1990 CFE Treaty, the Gulf war and events in Eastern Europe and the former Soviet Union are likely to lead to major changes in the arms export markets of the Russian Federation;

(g) For the period 1986-1990, the major export markets for United States weapons were Japan, Spain, Egypt, Saudi Arabia, the Republic of Korea, Germany, Israel, Australia, Canada and Turkey. France's major export markets were Saudi Arabia, India, Iraq and the United Arab Emirates, and those of the United Kingdom were Saudi Arabia and India;

(h) In some countries, arms exports are a major source of employment. Estimates suggest that at least 25 per cent of Western Europe's 1.5 million arms workers depended on exports to the third world alone, with dependence on arms exports for the United States being in the region of 10-15 per cent in the late 1980s, compared with an estimated 25 per cent in the former USSR (Renner, 1991). Defence industries in Austria, Belgium, Czechoslovakia, France, Italy and Sweden are particularly dependent on arms exports, 40 per cent or more of their military production being exported in the mid-1980s (Renner, 1991, p. 128).

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Table 7. The arms trade, 1986-1990

(Millions of US dollars; 1985 prices)

	Exports to			
Exporters	Third world	Industrialized countries	Total 1986-1990	Total 1990
Top-ranking 5				
USSR	43 169	17 631	60 779	6 373
United States	21 761	32 050	53 811	8 738
France	10 490	3 293	13 873	1 799
United Kingdom	6 210	1 542	7 752	1 220
China	7 569	-	7 684	926
All	101 464	63 767	165 232	21 726

	Imports by			
Importers	Third world	Industrialized countries	Total 1986-1990	Total 1990
Top-ranking 5				
India	16 989		16 989	1 541
Japan		10 971	10 971	2 083
Saudi Arabia	10 838		10 838	2 553
Iraq	10 314		10 314	59
Afghanistan	5 742		5 742	1 091
All	101 464	63 768	165 232	21 726

Source: SIPRI, 1991.

90. One of the main findings is that arms exports and imports are highly concentrated among a few sellers and a few buyers (oligopoly and oligopsony). In principle, with such small numbers of countries, it becomes easier to control the international arms trade.

D. Policy proposals: the difficulties of regulation

91. There have been many calls for controls on the international arms trade. Some States have adopted voluntary unilateral controls, refusing to export any arms, or refusing to export certain types of weapons, such as nuclear or chemical, or refusing to export to certain countries and regions. Elsewhere, there have been calls for world-wide action by the United Nations or for regional action by organizations such as the European Community. In response to the many and varied calls for action, some useful progress has been achieved.

92. Weapons of mass destruction are the subject of international agreements already existing or currently under negotiation. These actual or planned agreements relate to nuclear, chemical and biological weapons and none allow, or would allow, the international transfer of such weapons. There is, though, the possibility that States might acquire such weapons through illicit international trade; or by developing a domestic capability through recruiting leading scientists on the international labour market. A further development was the 1987 Missile Technology Control Regime in which a number of countries agreed on guidelines to reduce the risks of nuclear proliferation by controlling transfers that could make a contribution to weapon delivery systems other than manned aircraft (i.e., missiles; see A/46/301). More recently, in 1991, the five permanent members of the Security Council agreed on guidelines for conventional arms transfers (Conference on Disarmament, 1991), and this was followed in 1992 by the creation of the Register of Conventional Arms. For the Register, Member States are requested to provide data on their imports and exports of battle tanks, armoured combat vehicles, artillery systems, combat aircraft, attack helicopters, warships and missiles. By showing both buyers and sellers, the Register will provide a better means of assessing international arms transfers compared with military expenditure data which is provided by one source only.

93. The difficulties of reaching multilateral agreement on arms transfers should not be underestimated. A mere listing of some of the major problems is sufficient to indicate the magnitude of the task. There are:

(a) Problems of definition. For example, the Register focuses on major conventional equipment. However, some equipment might be difficult to classify, such as trainer aircraft which have combat capabilities or helicopters which might easily be given an attack role. Also, a concern with major equipment will omit small weapons and the international trade in key parts and components. Finally problems arise from the international trade in civil goods and services which have a dual use;

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(b) Problems of verifying and enforcing an international agreement, especially one involving large numbers of countries. Will all supplier countries accept an agreement and how will it be enforced? Black markets and illicit transfers are likely to emerge (e.g., Iraq). In such situations, some institutional mechanism is needed to reduce the incentives to cheat and to bypass any agreement;

(c) Economic pressures to export. In addition to providing jobs and foreign currency, arms exports are sometimes used to justify the national development of costly new weapons programmes. For example, a country might decide to develop a costly new combat aircraft on grounds that it is likely to obtain large export markets which will contribute to research and development costs and lead to lower unit costs through economies of scale (e.g., France and the United Kingdom). Further pressures to export and to abandon restrictions on arms exports will come from defence industries in NATO and the former Warsaw Pact which are seeking new markets to replace their declining domestic markets;

(d) Substitution effects. Countries unable to import arms for their security and protection are likely to create their own domestic defence industries. Indeed, there is evidence that an increasing number of third world importing countries are demanding licensed production and offset deals, designed to establish a local defence industrial capability. This is particularly the case where the defence industry is viewed as a leading high technology sector (infant industry case). It is also possible for a country to establish a defence technology capability by directly entering the international labour market and recruiting key scientists, technologists and engineers. And once a third world country has created a domestic defence industry, it will also be seeking export markets.

94. A focus on the problems of regulation is not meant to suggest that an international or regional agreement on the arms trade is undesirable or impossible. Negotiating such an agreement is likely to be a complex and challenging task, but the implications of not doing anything could be serious and costly. Here, it is possible to envisage various alternative future scenarios:

(a) A laissez-faire policy, leaving the international arms trade to market forces (heavily influenced by Governments);

(b) Building on the Register of Conventional Arms, by ensuring that all countries respond and by extending the Register to include small weapons, dual-use products and trade in key technologies;

(c) Encouraging unilateral restraint by buyers and sellers of arms;

(d) Encouraging limited agreements involving a small number of countries, such as the major arms exporters, specific weapons and certain regions of the world;

(e) Aiming for a comprehensive agreement seeking to embrace all countries of the world; for example, building on existing arms agreements such as the Treaty on the Non-Proliferation of Nuclear Weapons.

95. Some of these scenarios could be pursued simultaneously, for example, (b), (c) and (d). Clearly, further moves to build on the Register are probably most feasible. Here, the aim would be to promote greater transparency which, in turn, might facilitate the introduction of unilateral or multilateral measures to restrain international arms transfers (see A/46/301). However, before pursuing this or any other policy option, questions need to be asked about the aims and underlying rationale of international restraint or agreements on arms transfers. Such agreements might help to make the world a safer place, but they do not necessarily mean the end of the arms race.

VII. ARMS RACE AND ARMS LIMITATION ISSUES

A. Introduction: the key issues

96. Arms limitation embraces both treaty-based international arms control agreements and unilateral limitations on, and reductions in, arms. Major developments in arms limitation have occurred since 1986. Agreements on nuclear and conventional forces and the political changes in Eastern Europe and the former USSR have resulted in the prospect of a disarmament race replacing the arms race of the cold war.

97. A more recent development has been national disarmament initiatives through unilateral cuts rather than treaty-generated cuts, for example, the Treaty between the United States and the USSR on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (INF Treaty) and the START and CFE Treaties. These unilateral cuts, especially those in the Soviet Union and its successor republics, those in the other former Warsaw Pact countries, and those in the United States and other NATO States have become much more important than bilateral or multilateral treaties in generating reductions in defence expenditures. Before President Gorbachev's statement to the General Assembly at its forty-third session, on 7 December 1988 (see A/43/PV.72), negotiated cuts were the main routes to disarmament, but after this speech and later world developments, unilateral initiatives have become the main route, including President Bush's announced reductions of September 1991, President Gorbachev's responses in October 1991, the further reductions announced by Presidents Bush and Yeltsin in January 1992 and later decisions in the United States, the Russian Federation and other European countries.

98. Arms limitation aims to reduce the risks of regional or global conflicts by reducing or ending the arms race between nations. Examples include the arms race of the United States and the former USSR between the late 1940s and 1990 and the regional arms races in the Middle East, India and Pakistan, the Democratic People's Republic of Korea and the Republic of Korea and Central and South America. For the 1990s, there are worries that new technology will

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create future arms races (e.g., the Strategic Defense Initiative (SDI)) and that nations will be reluctant to sacrifice their latest technology for fear of losing a military advantage. There are further concerns about new regional arms races; about the proliferation of nuclear, chemical and biological weapons; and about international terrorism and fears of instability leading to wars. But reducing the risk of war is not the only aim of arms limitation. There are further economic benefits. Arms control saves money and releases resources that can ultimately be used for producing valuable civil goods and services (Schelling, 1966; A/43/368).

B. Economic models of the arms race

99. An arms race arises where two or more rival States compete with each other to acquire arms. An understanding of why countries acquire arms is central to explaining the arms race and to formulating appropriate arms limitation measures. Models of the arms race start from the simple proposition that States arm in response to the threats they believe to come from rival States. The Richardson model shows that a State will increase its defence spending in response to the higher military spending of its rivals and that its response is also affected by grievance and fatigue or economic factors (Richardson 1960). Grievance can reflect the desire for revenge for past defeats (e.g., Germany after 1918). The model also recognizes the costs or economic burdens of defence spending such that over a period of time, as more resources are allocated to defence, a nation will find it too costly to continue incurring substantial sacrifices of civil consumption: hence the possibility that economic pressures are the ultimate arms controller (Hartley and Hooper, 1990b).

100. Arms race models are an obvious starting-point in analysing the outbreak of war. Some analysts have claimed that a continuous upward spiral of armaments in two rival nations must inevitably result in war (Richardson, 1960). However, alternative models have suggested that in various situations a two-nation arms race might lead to either war or peace and that, conversely, disarmament can preserve peace or result in war. For example, an arms race could lead to peace and stability if it resulted in both sides reaching a position of mutual deterrence; for example, the arms race between the United States and USSR in the 1960s and 1970s. Alternatively, disarmament could lead to war if both sides move from a stable position of mutual deterrence to an unstable one in which each can attack the other (Intriligator and Brito, 1984). Examples where disarmament was eventually associated with war include Europe in the 1930s and the Falkland Islands (Malvinas) in the early 1980s. Difficulties arise, however, because the world is dominated by uncertainty: situations of instability are usually identified with hindsight. Uncertainty is increased by technical progress (via military research and development) which provides an opportunity for one side to obtain a temporary military advantage; for example, the United States nuclear monopoly after 1945. Further potential for instability arises in a "multipolar" rather than a bipolar world: hence, it is possible that reductions in tension between the big Powers could increase regional tensions and instability.

C. An example: the Middle East

101. The Middle East furnishes an example of regional conflict and of the relationship between regional and world stability. It provides a case study of arms industrialization, the arms trade, the impact of the cold war, arms races, wars, and the potential for arms limitation. There have been a succession of Arab-Israeli wars, a major war between Iraq and Iran and more recently the Gulf war. These conflicts have often resulted from national rivalry and from international disputes about territory and about assets (oil reserves). The threat of conflict has been reflected in arms imports. Between 1986 and 1990, the Middle Eastern countries imported over $50 billion of major conventional weapons, representing over 40 per cent of total arms imports by third world countries, the suppliers being the five principal arms-exporting countries (1985 prices: SIPRI, 1991). More recently, weapons of mass destruction and their delivery systems have been introduced into the region although not always officially acknowledged (i.e., nuclear, chemical and possibly biological weapons). In addition some countries have created an indigenous defence industry, particularly Egypt and Israel and, until recently, Iraq.

102. Various agreements have been introduced into the region to reduce conflict. Examples include the Egypt-Israel peace treaty of 1979 which has reduced the chances of surprise attack; the Tripartite agreement between France, the United Kingdom and the United States (1955) which limited arms exports to the Middle East, until Soviet arms deliveries to Egypt began in 1958 (an example of the impact on the region of the cold war); and the presence of United Nations peace-keeping forces in a number of countries. Furthermore, the Security Council, in its resolutions 687 (1991) of 3 April 1991 and 707 (1991) of 15 August 1991, decided that Iraq should accept the elimination of all its chemical and biological weapons and their supporting facilities, the destruction or removal of all ballistic missiles and associated production facilities and a halt to all nuclear activities.

103. Past experience underlines the need for cooperation between external and regional actors in the implementation of disarmament arrangements. Foreign-sponsored measures are insufficient in the absence of regional support, or if they do not include all arms suppliers. For instance, the arms control regime embodied in the Tripartite agreement of 1955 was circumvented several years later by Egypt's desire to obtain arms and the Soviet Union's readiness to satisfy this desire. Also important is the link between disarmament measures and conflict resolution. These measures are not just technical issues, but rather reflect the quality of political relations between States. Thus, in the present peace process, disarmament arrangements are discussed in the larger political context, which includes the negotiations on regional issues such as water, refugees, the environment and economic development.

104. Experience in the Middle East suggests three lessons for policy makers. First, questions arise about the adequacy of existing institutional arrangements for the peaceful resolution of international disputes. It would

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appear that there are gaps in the existing arrangements which mean that nations are unable to enter into mutually beneficial discussions and exchange. Since the 1991 Gulf war, there has been some progress in negotiations and the beginnings of a peace process between traditional antagonists. Second, the Middle East experience suggests that demilitarized zones, or zones free of weapons of mass destruction, observers and notification (as in the case of United States observers in the Sinai), the curtailment of military movements and confidence-building measures can contribute to reducing international tension and the chances of regional conflict. Third, a new round of international arms limitation measures might focus on limiting arms exports to regions of potential conflict, particularly the Middle East. The problem is to ensure that such an agreement is binding and that one country does not exploit the opportunities for gaining export sales. Some limited progress was made in 1991 when the five permanent members of the Security Council agreed to inform each other about transfers to the Middle East of tanks, armoured vehicles, military aircraft, helicopters, naval vessels and certain missile systems (Conference on Disarmament, 1991).

D. Arms limitation agreements

105. References to arms races and arms limitation often tend to oversimplify a complex situation. Arms limitation involves any initiative to reduce or limit weapons and armed forces. The initiative can be unilateral, bilateral or multilateral and it can be voluntary or compulsory. For example, after a war, the victors might impose disarmament on the defeated nation. Another example was the July 1992 meeting of the Group of Seven States, at which was stressed the urgent need to halt the spread of nuclear and other weapons of mass destruction, including aid to prevent the transfer of atomic material from the former Soviet Union. Current arms limitation agreements and the main obligations under them are shown in table 8.

Table 8. Arms limitation agreements

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Geneva Protocol, 1925 a/								X						
Antarctic Treaty, 1959									X	X				
Outer space Treaty, 1967 b/									X	X				
Treaty of Tlatelolco, 1967 c/								X	X	X	X	X	X	
Non-Proliferation Treaty, 1968 d/											X	X	X	
Sea-bed Treaty, 1971 e/									X					
Convention on biological weapons, 1972 f/								X	X	X	X	X	X	X
ABM Treaty, 1972 g/			X	X		X							X	X
SALT I and II, 1972-1979 h/			X		X	X				X				
Nuclear test-limitation treaties, 1974-1976 i/				X										
Environmental Modification Convention, 1977 j/								X						
Moon Agreement, 1979 k/								X	X	X				
Conventional weapons Convention, 1981 l/		X						X						
Rarotonga Treaty, 1985 m/									X	X	X	X		
Stockholm Document, 1986 n/		X												
Vienna Document, 1990 n/		X												
INF Treaty, 1987 o/	X								X	X	X	X		X
US-USSR chemical weapons Agreement, 1990 p/					X							X		X
CFE Treaty, 1990 q/			X		X									X
START Treaty, 1991 r/			X		X	X				X	X			X

Source: De Jonge Oudraat, *in* Sur, 1991a.

1: Establishment of database; 2: Limitation of use; 3: Limitation of deployment; 4: Limitation of testing; 5: Limitation of possession; 6: Limitation of production; 7: Limitation of transfer; 8: Prohibition of use; 9: Prohibition of deployment; 10: Prohibition of testing; 11: Prohibition of possession; 12: Prohibition of production; 13: Prohibition of transfer; 14: Destruction.

(Footnotes on following page)

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(Footnotes to table 8)

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a/ Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare.

b/ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.

c/ Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean.

d/ Treaty on the Non-Proliferation of Nuclear Weapons.

e/ Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-Bed and the Ocean Floor and in the Subsoil Thereof.

f/ Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction.

g/ Treaty between the United States and the USSR on the Limitation of Anti-Ballistic Missile Systems.

h/ Various agreements reached after the first phase of the Strategic Arms Limitation Talks; also the Treaty between the United States and the USSR on the Limitation of Strategic Offensive Arms (SALT II Treaty; never entered into force).

i/ Treaty between the United States and the USSR on the Limitation of Underground Nuclear Weapon Tests (1974); Treaty between the United States and the USSR on Underground Nuclear Explosions for Peaceful Purposes (1976).

j/ Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques.

k/ Agreement Governing the Activities of States on the Moon and Other Celestial Bodies.

l/ Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects.

m/ South Pacific Nuclear Free Zone Treaty.

(Footnotes to table 8) (continued)

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n/ Document of the Stockholm Conference on Confidence- and Security-Building Measures and Disarmament in Europe. Vienna Document (1990) of the Negotiations on Confidence- and Security-Building Measures.

o/ Treaty between the United States and the USSR on the Elimination of Their Intermediate-Range and Shorter-Range Missiles.

p/ Agreement between the United States and the USSR on Destruction and Non-Production of Chemical Weapons and on Measures to Facilitate the Multilateral Convention on Banning Chemical Weapons. Not yet in force.

q/ Treaty on Conventional Armed Forces in Europe. Not yet in force.

r/ Treaty on the Reduction and Limitation of Strategic Offensive Arms. Not yet in force.

106. At the outset, Governments and their arms control negotiators have to decide which aspects of defence expenditure, force structures and weapons they wish to regulate. Here, problems arise in applying models of the arms race so that they can guide arms control negotiators: what are the likely effects on peace and stability of different types of initiatives and agreements involving, say, manpower or nuclear or conventional equipment? Table 9 presents a framework outlining the range of defence variables which could be the focus of arms limitation initiatives and agreements. It uses an armaments life-cycle approach in which the possible variables for control include research and development, testing, production, deployment, storage, transfer, withdrawal or destruction.

Table 9. The armaments life-cyle and examples of arms limitation agreements

Life-cycle	Examples
Research and development	Convention on biological weapons (1972)
Testing	Partial test-ban Treaty (1963) [a]
Production	INF Treaty (1987)
Deployment	CFE Treaty (1990)
Storage	Chemical weapons Agreement (1990)
Transfer	Nuclear non-proliferation Treaty (1968)
Withdrawal or destruction	START Treaty (1991)

Source: Crawford, *in* Sur, 1992.

[a] Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water.

E. Some problems: substitution, uncertainty and non-compliance

107. Economic agents in the military-industrial complex are always seeking alternative ways of ensuring national security, of making money and protecting their incomes and budgets. Thus, a successful arms limitation agreement for one class of weapons might lead to the search for new weapons and the continuation of the arms race in new and different forms. For example, controls on nuclear weapons might lead to an expansion of conventional weapons; or controls on cruise and ballistic missiles might lead to the purchase of more aircraft (Brito and Intriligator, 1981).

108. Technical progress makes life even more difficult for arms control negotiators. It increases uncertainty so that no one can predict accurately

the future. New weapons resulting from current military and/or civil research and development could create future instabilities and threats to world peace (e.g., MIRV, SDI). However, the major Powers are reluctant to include new defence technologies in any arms limitation agreement for fear of losing a military advantage which might threaten national security. It is also possible that States might sign an agreement knowing that they can break out of it at a later date.

109. Compliance with arms limitation agreements is also a major problem, which is why States insist upon agreed verification arrangements. Some agreements are more easily verified. For example, the 1987 INF Treaty can be verified by, inter alia, observing the missiles being destroyed - assuming that both sides have provided accurate data on their stocks. National technological means such as satellites can also be used to detect non-compliance. However, the verification problems are much greater where large civil sectors and civil firms are affected by arms limitation agreements, as in the case of chemical weapons. Understandably, civil firms will wish to protect legitimate technological and commercial secrets resulting from their research and development activities and will resist verification from fear of industrial espionage. In addition, verification can impose a substantial burden on firms in the affected area, as they have to deal with the requirements of reporting and on-site visits (Sur, 1991a, 1991b, 1992).

F. Benefits and costs

110. Arms races are costly. They use scarce resources of qualified scientists and engineers, skilled manpower, unskilled labour, plant and equipment, energy and materials. All these inputs are required to produce equipment, provide personnel and the supporting infrastructure for the armed forces. There are also indirect costs as companies and their workforces associated with the military-industrial complex acquire a culture of dependency on government defence contracts, rather than a culture of enterprise in which firms have to survive in competitive markets; and a culture of dependency could adversely affect international competitiveness. These costs of the arms race show the potential benefits of arms limitation leading to disarmament: the release of resources for alternative civil uses.

111. Disarmament resulting from arms limitation initiatives will involve some adjustment costs (see chap. IX). Industries, workforces, military personnel and towns dependent on defence spending will be the focus of these adjustment costs. Adjustment will take time and will be reflected in some unemployment of both capital and labour as well as in the costs of reallocating resources to alternative uses. Similarly, time will be needed to obtain the benefits of disarmament. As an investment process, disarmament involves short-run costs in return for long-run benefits. In addition to the adjustment costs associated with disarmament, arms limitation agreements involve substantial transaction costs in negotiating and bargaining and then monitoring and policing the agreement.

112. There are a few United States studies which have estimated the costs to the United States of verification and compliance associated with five arms limitation agreements. One study undertaken by the Congressional Budget Office analysed the START Treaty, the Treaty on the Limitation of Underground Nuclear Weapon Tests (the threshold test-ban Treaty) and the Treaty on Underground Nuclear Explosions for Peaceful Purposes, and the Chemical Weapons Agreement of 1990 (all between the United States and the former USSR) and the CFE Treaty. The cost estimates distinguished between one-off and recurring annual costs. One-off costs included the destruction of equipment and facilities and creating the facilities for on-site inspection: these costs are likely to be incurred over a period of 5 to 10 years from the agreement. Annual or recurring costs included routine inspections, continuous monitoring of some sites and inspections at sites suspected of hiding equipment limited under the treaty. The Congressional Budget Office cost estimates for the five agreements are presented in table 10. United States compliance and inspection costs range from $0.6 billion to $3 billion for one-off costs and $0.2 billion to $0.7 billion for recurring costs (1990 prices: United States Congressional Budget Office, 1990). More than half the costs are associated with the START Treaty. In return, there will be substantial savings for the United States. The START and CFE treaties are eventually expected to reduce defence expenditure by at least $9 billion per annum below its 1990 level (*ibid*., 1990). Further substantial savings are available from more nuclear arms control agreements. For example, according to the Congressional Budget Office, a post-START option to reduce the number of strategic warheads to 3,000 might save the United States over $15 billion annually (*ibid*., 1991).

Table 10. *Compliance and inspection costs for the United States*

(Millions of United States dollars; 1990 prices)

Treaty or agreement	One-off costs	Annual costs
START	410 - 1 830	100 - 390
CFE	105 - 780	25 - 100
Threshold test-ban Treaty and Peaceful nuclear explosions Treaty	85 - 200	50 - 100
Chemical weapons Agreement	45 - 220	15 - 70
Total	645 - 3 030	190 - 660

Source: United States, Congressional Budget Office, 1990.

G. Conclusion

113. Arms limitation agreements involve costs as well as benefits. There are direct costs associated with negotiating implementation and ensuring compliance through verification and inspection, as well as the costs of adjusting to change. Arms limitation agreements which involve high verification, inspection and destruction costs need to be subjected to critical cost-benefit scrutiny to determine that they are worthwhile. For example, with chemical weapons, an elaborate and resource-intensive inspection system might be too costly and a much lower level of inspection could produce substantial savings and make an agreement worthwhile (i.e., where the benefits exceed cost). In other words, a less than complete and comprehensive inspection system might be the best solution (Sur, 1991b, part four). Nor should the environmental costs of destroying weapons be ignored. The destruction of nuclear and chemical weapons involves major environmental problems. At the same time, the business of destroying weapons will create new market and employment opportunities to replace some of the job losses in defence industries.

114. Arms limitation is an area relatively under-researched by economists. There are challenging opportunities to apply and integrate various economic models and analytical techniques; there is a need to speculate and predict the nature of future arms races (e.g., which countries will be involved with which weapons?); and a need to predict the likely response of the military-industrial complex to different arms control regimes.

115. In all three major regions of the world - industrialized market, former socialist and developing - there are substantial economic benefits that could be achieved as a result of disarmament but only if appropriate policies are pursued, particularly at the national level. Such policies could be greatly facilitated by a new round of arms limitation agreements, negotiated bilaterally or multilaterally among both former foes and former allies. In the 1960s, 1970s and 1980s arms control agreements, particularly those involving the United States and the Soviet Union, such as SALT and START, were negotiated and concluded with the goal of achieving strategic stability in avoiding war. These agreements had only relatively minor effects on defence expenditures, which continued to rise. In the current period, defence expenditures are falling in the United States, the former Soviet Union and the countries of NATO and the former Warsaw Pact, which, taken together, account for a substantial portion of worldwide military expenditure. It must not be forgotten that one of the three goals of arms control, as enunciated by Thomas Schelling in the 1960s (Schelling, 1966), was to reduce the cost of defence (the other two being reducing the chance of war and reducing damage in case war does occur).

116. A new set of arms limitation agreements could achieve this economic goal. These agreements could help reduce the costs of disarmament, shorten the transition period between costs and benefits, increase the benefits of disarmament, and thus greatly increase the economic return from disarmament, when considered as an investment process. Such agreements might be negotiated

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between former foes and allies. These agreements would call for gradual, steady and predictable reductions in defence expenditures, reductions in military and defence establishment personnel, reductions in military procurement and stocks, reductions in military research and development and so on. They would also call for mutual and cooperative programmes to assist in retraining and relocating displaced military and civilian personnel, and in reallocating other resources affected by disarmament.

117. Another aspect of this new round of arms limitation agreements would be limitations on arms exports to regions of potential conflict, particularly the Middle East. In the absence of enforceable multinational agreements there will be enormous temptations, on the part of any country reducing defence expenditures, to increase arms exports so as to keep production lines going, to keep workers employed, to avoid economic disruptions, and to earn foreign exchange. Yet another dimension of this new round of arms limitation agreements would be a tightening and formalization of previous formal and informal agreements not to export weapons of mass destruction and sensitive technologies required for such weapons, so as to limit their proliferation. Such agreements could build on the Nuclear non-proliferation Treaty and the London Suppliers Group (Zangger Committee) for nuclear weapons, the Missile Technology Control Regime for missiles, and the Australia Group for chemical weapons. A further feature of these new agreements would be the creation of cooperative ventures to redirect scientific and technical personnel and facilities formerly used in weapons laboratories and in weapons production to collaborate on addressing major global problems, including those of the environment, energy, and use or disposal of nuclear reactors, which would both re-channel science and technology capabilities in productive directions and avoid the movement of skilled personnel to countries developing weapons of mass destruction. In other words, the opportunities for new arms limitation agreements are numerous and challenging, and the eventual benefits could be substantial and attractive. In the short run, though, there will be transition and adjustment costs.

VIII. DISARMAMENT AND DEVELOPMENT

A. Introduction: the issues

118. Defence spending in developing countries is similar in principle to that in industrialized countries but different in the magnitude and nature of its opportunity costs. Developing countries are generally poor. A large part of their populations suffer from poverty resulting in starvation, ill-health, poor housing and illiteracy. Spending extremely scarce capital, including foreign exchange, and skilled labour resources on defence involves substantial sacrifices of other economic opportunities in terms of growth and economic development. It adversely affects present as well as future living standards (UNDP, 1992). And at the very moment when the big Powers are shifting from an arms race to a disarmament race, the developing countries are facing the prospect of regional arms races and regional conflicts. The 1980-1988 Iraq-Iran war and the 1991 Gulf war are recent and costly examples of such conflicts. For the future, there is growing international concern about individual developing countries acquiring nuclear, biological and chemical weapons not only to start new, dangerous and costly regional arms races but even to destabilize the prospects for global peace (see chap. VII).

119. The desire of many developing countries for modern weapons has also been reflected in their import of arms, which has added significantly to their external debt and payment burdens. The prospect of disarmament both within and between NATO and the former Warsaw Pact States will add a new dimension. Defence contractors faced with reduced markets for their national armed forces will be vigorously seeking new market opportunities overseas; and developing countries are a potential outlet for the surplus capacity in the defence industries of industrialized countries (see chap. VI). At the same time, by 1989, eight developing countries (according to ACDA definitions) were among the world's 20 principal arms exporters: China, Israel, the People's Democratic Republic of Korea, Egypt, Bulgaria, Chile, Yugoslavia and Spain (ACDA, 1990).

120. Inevitably, the prospects of East-West disarmament will create pressures and expectations that some of the peace dividend available to industrialized countries will be used to aid development in the poorer nations (UNIDIR, 1987; UNCTAD, 1992). Such proposals, however, are fraught with difficulties. First, disarmament viewed as an investment will not lead to the immediate or short-term release of resources. Second, the resources released and available are unlikely to be large. Third, when funding and resources become available in industrialized countries, it does not follow that they will be allocated to development in the third world. In other words, there is no mechanism which automatically ensures the immediate international transfer of funds from defence to development (i.e., the international redistribution of income: Schmidt, 1989). It is, however, open to developing countries to disarm themselves as a means of promoting their own development.

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B. The stylized facts

121. Third World countries account for about 15 per cent of total world military spending; but they have relatively high defence burdens in terms of defence shares in GDP and as a share of central government budgets. Often, actual or potential inter-State conflicts are the reasons for high defence spending. Table 11 shows the 20 countries with the greatest defence burdens. The paradox is apparent: relatively poor nations are often bearing the highest defence burdens.

Table 11. Twenty countries with greatest defence burdens, 1988-1990

Country	Defence as a percentage of GDP	Defence expenditure (millions of US dollars; 1988 prices)
Nicaragua	28.3	350
Iraq	23.0	9 268
Angola	21.5	703
Saudi Arabia	19.8	15 213
Yemen a/	18.5	232
Oman	15.8	1 352
Ethiopia	13.6	786
Mongolia	11.7	266
Cuba	11.3	1 804
Jordan	11.0	522
Bahrain	10.7	200
Israel	9.2	3 807
Syrian Arab Republic	9.2	2 070
Democratic People's Republic of Korea	8.8	2 003
Honduras	8.4	279
Zimbabwe	7.9	350
Libyan Arab Jamahiriya	7.4	1 780
Greece	6.8	3 041
Pakistan	6.7	2 906
Kuwait	6.5	1 518
United States of America b/	5.8	268 113
United Kingdom b/	4.0	32 470
Japan b/	1.0	30 483

Source: SIPRI, 1991.

a/ The former People's Democratic Republic of Yemen.

b/ Shown for comparison.

C. Defence expenditure: a burden or a benefit?

122. Defence expenditure interacts in complex ways with the process of economic development (see also chap. II). One view suggests that the effects are beneficial, with the armed forces providing training and developing economic and social infrastructure (e.g., communication systems) which benefit the civil economy. In addition, military forces can contribute to civil programmes through emergency relief and medical care; they might remove corruption; they can introduce the discipline needed for social cohesion; they can change traditional values, thus contributing to modernization and nation-building; and they can provide the internal order needed to promote economic activity. Military expenditure can also stimulate aggregate demand, resulting in a higher degree of capacity utilization which may increase employment and growth. The creation of an indigenous defence industry can even be used as a tool for removing the foreign exchange constraint on economic development if sufficient exports of arms are achieved (Benoit, 1973).

123. Critics point to the obvious unproductive use of resources and hence the burdens and wastes of defence spending, especially for relatively poor developing countries. High levels of military spending are believed to contribute to domestic economic hardship in the short run and to lower growth in the long run by diverting resources from pressing social welfare programmes, such as education and health, and from economic development projects, for example, improving agricultural output to reduce famine and hunger. At the same time, developing countries are major importers of arms, which absorbs their limited foreign currency holdings and contributes to their external debt problems. With about one fifth of global income, they account for more than half of arms trade deliveries (Deger and Sen, 1990a). The military can also become a conservative institution with its own vested interests, resistant to change. And if it is argued that the military provides education and training, then it can be counter-argued that there are often alternative and more cost-effective methods of creating marketable human capital for economic development.

124. It may be thought that these alternative views about the impact of defence spending on development can be resolved by empirical testing. A pioneering statistical study by Benoit found evidence of a positive relationship between defence burdens and growth rates, concluding that military expenditures are not necessarily detrimental to growth (Benoit, 1973). However, these findings were criticized because of the simplistic nature of the statistical work reflected in the ad hoc form of the estimating equations, the possibility that the results were spurious, reflecting the influence of other variables and two-way causation, and the failure to specify exactly the causal relationships and the transmission mechanism from defence spending to growth. More sophisticated econometric tests have since been undertaken. These tend to show a positive direct impact of defence spending on growth but a negative indirect impact on the savings ratio. Since this ratio's impact on growth is significant and positive, once both the direct and indirect effects are combined, the total net result could be that military expenditure has a negative effect on growth (Deger and Smith, 1983; Deger,

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1986). However, in reviewing the conflicting evidence it has to be recognized that economists' models of growth and development are far from satisfactory. "Until it is possible to adequately explain growth, it is impossible to provide definitive empirical conclusions as to the impact of military expenditures on growth" (Hewitt, 1991, p. 28).

125. Not surprisingly, countries are different and empirical results on the defence-development relationship differ over time and between States. Much depends on the alternative use of military expenditure, especially its composition. Defence spending might promote growth if it replaces or crowds out private or public consumption expenditures; but it is likely to have an adverse impact on growth if it crowds out productive private investment or efficient government investment in infrastructure. Moreover, the growth benefits of defence spending can be achieved more efficiently by programmes that are directly targeted at specific objectives like education, training and health expenditures which are more efficient methods of creating marketable human capital (Hewitt, 1991). However, efforts to transfer resources from the military to the civil sector may be particularly difficult in developing countries where labour and capital markets might not be sufficiently developed to generate appropriate market price signals or because the military is resistant to such change (see chap. IX on the problems of conversion in formerly centrally planned economies involving a similar lack of market price signals).

126. A distinction also needs to be made between those countries which manufacture arms and those which do not. Arms-producing countries will probably face greater problems in adjusting to disarmament, with short-run transition costs associated with the possible loss of both high technology and arms exports.

127. For both industrialized and developing countries, disarmament has an impact on monetary expenditures and on real resources of labour, capital, land and enterprise. In principle, expenditure flows can be switched more easily from the military to the civilian sector, but converting the existing military capital stock to civilian use is more difficult. Indeed, in many developing countries with acute unemployment problems, such conversion may create additional short-run technological unemployment rather than releasing skilled manpower for contributing to growth and development (see chap. XI). On the other hand, though, the problem of conversion of a large military capital stock is less pressing in many developing countries, as they do not have a significant domestic military-industrial base.

D. The challenge: the opportunities for change

128. The tremendous opportunity costs of defence spending for developing countries, the continued regional arms races and the potential for conflict present both a threat to world peace and a challenge to the United Nations and the international community. Proposals have been made for greater transparency of information on military expenditure and the arms trade. Such

proposals would apply to all countries, both industrialized and developing, the information being collected by the United Nations as a universal organization. A start was made in 1992 with the establishment of the Register of Conventional Arms, which was designed to record international arms transfers in specific groups of weapons and to provide information on the military holdings and procurement of Member States (General Assembly resolution 46/36 L, annex). It is also apparent that at a time of successful arms control agreements between the big Powers, "Third World regional arms control is conspicuous by its absence" (Deger and Sen, 1990a, p. 26). Such absence might reflect gaps in the existing international institutional arrangements, preventing worthwhile arms control negotiations and agreements between States (an exception being the current Middle East negotiations). It may also suggest that the causes underlying various regional arms races are insufficiently understood.

E. An example: India and Pakistan

129. The Indian subcontinent is one of the poorest and most populous regions in the world. Military expenditure has an exceptionally high opportunity cost in this context of mass poverty. Yet the continuing tension between India and Pakistan over more than four decades provides an illustration of how regional conflict may degenerate into a regional arms race. During this period the two countries have fought three full-scale wars and numerous border skirmishes which prevented any significant decline in military expenditure in either country. Pakistan spends more in per capita terms and as a proportion of GDP (about 6.8 per cent compared to India's some 4 per cent), but India spends far more in absolute amount, reflecting the significant difference in size of the two countries. Nevertheless, at least in part, this arms race might be internally driven. As two relatively young nation-States, born in the hostility of partition of colonial British India, both found it difficult to cooperate and compromise. On the other hand, taking a tough and non-cooperative military posture became a preferred option for building nation-States.

130. The India-Pakistan case illustrates two important issues. First, the need for early warning systems so that special attention may be paid by the United Nations to "sensitive" regions before regional arms races actually set in. Second, the need for identifying and discussing contributory internal factors which become externalized into regional arms races.

F. Future prospects

131. A comprehensive and ambitious proposal has been developed by Robert McNamara in the form of a model or vision of a new world order (McNamara, 1991). The aim of this new world order is to achieve significant long-term savings in defence budgets, so providing resources for restructuring both industrialized and developing countries; and these changes are to be made without reducing security. To achieve this new world order a number of policy initiatives are required:

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(a) Further arms reduction agreements embracing nuclear, biological and chemical weapons and ballistic missiles. These arms agreements are to be enforced by the Security Council using economic sanctions and military force, if necessary;

(b) For the United States and third world countries, cuts in defence budgets of 50 per cent are proposed;

(c) There are to be restrictions on the international arms trade;

(d) Aid to developing countries is to be tied to cuts in defence spending;

(e) The United Nations and regional organizations would provide collective security and peace-keeping roles using multinational forces;

(f) It is recognized that these changes will take time, probably a decade or more.

132. While the aims are likely to be widely accepted, controversy will centre on the means and the problems which will be encountered in creating such a new world order. For example, the international community will need to agree on a set of general rules governing behaviour and relations between States and the obligations of the international community. Some States, such as the oil-exporting countries, do not depend on foreign aid; others will oppose the proposal as an infringement of national sovereignty. It also needs to be recognized that the military-industrial complex in industrialized countries will try to thwart and bypass arms control agreements while some Governments in developing countries would try to "uncouple" aid issues from cuts in defence spending. These proposals may also have unintended side effects. For example, controls on arms exports might lead to the creation or expansion of domestic defence industries (Hartley, 1991b). None the less, such visions of a new world order indicate both the challenge and the tremendous opportunity open to the United Nations and the international community. One estimate suggests that 3 per cent annual cuts in military spending in rich and poor countries throughout the 1990s could yield a $1.5 trillion peace dividend for human development by the year 2000 (comprising $1.2 trillion in industrialized countries and $279 billion in the developing countries: UNDP, 1992, p. 8).

IX. ECONOMIC ADJUSTMENT AND CONVERSION

A. Introduction: the key issues

133. Typically, cuts in defence spending are presented as offering immediate benefits in the form of the peace dividend. This is an incorrect and misleading claim. As an investment process, disarmament involves initial adjustment and transition costs, reflected in unemployment and the underemployment of real resources. Often such problems and costs are ignored or assumed away, or it is asserted that they can be solved by appropriate

public policies. Rarely are the appropriate policies specified, so that inevitably the potential losers from cuts and disarmament will oppose policies which make them worse off. In this context, elementary welfare economics offers some policy guidelines by suggesting that society's welfare can only be improved if the potential losers are compensated in some way. This is the policy side of the problem which offers opportunities for minimizing adjustment costs and which is dealt with in part three (see chap. XI). Before dealing with the policy options, it is necessary to analyse the problems connected with conversion, transition and adjusting to cuts in military spending. Inevitably, this is a controversial field which has been dominated by myths, emotion and ideology, lacking analysis, critical content and supporting evidence (Kirby and Hooper, 1991; Paukert and Richards, 1991).

134. This chapter focuses on the investment costs which have to be incurred in order to obtain the eventual economic benefits of disarmament. The economics of change, adjustment and conversion are analysed as they affect both labour and capital resources in market and centrally planned or transitional economies and developing countries. As a starting-point, conversion is defined and a framework is presented for analysing the economic impact of cuts in military spending.

B. Defining conversion

135. Conversion has at least two interpretations. First, there is the narrow interpretation of converting defence plants into establishments manufacturing civil goods and, vice versa, converting civil plants into establishments manufacturing military goods. Effectively, this interpretation requires product substitution in which the same plant and workforce produces civilian products instead of military products. Such product substitution is not possible for the armed forces remaining within the military sector. However, with a change of ownership, there are product substitution possibilities for some of the armed forces defence facilities, which can be converted into civilian uses. Military air bases, for example, can be used as civil airports.

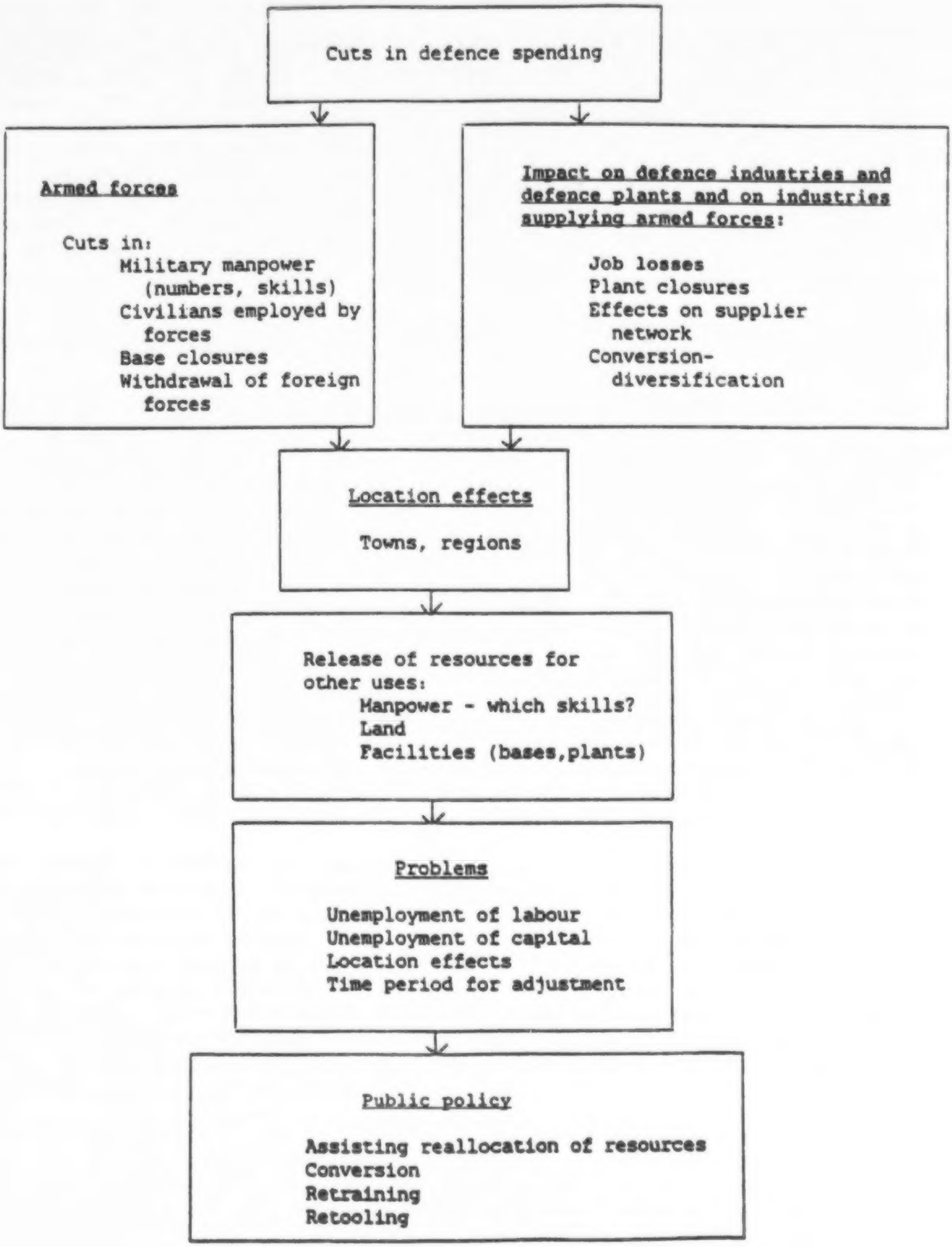
136. Second, a broader interpretation of conversion focuses on the process of reallocating resources released from the armed forces and from declining defence industries to the expanding sectors and regions of the economy. This factor reallocation process is occurring continuously in any dynamic economy and its success depends on the operation of the markets for labour and capital and on the general state of the economy (e.g., recession or prosperity). In this chapter, the broader definition of conversion is adopted. As will become apparent, adopting the narrow interpretation would lead to the conclusion that, in many cases, conversion will be neither technically nor economically feasible.

C. The costs of defence cuts

137. Where defence cuts are part of an arms limitation policy, two sets of costs are incurred. First, arms limitation itself is not costless: there are costs of bargaining, verifying, inspecting and destroying arms (see chap. VII). These costs can vary from relatively small to substantial. Unilateral arms limitation initiatives will avoid some of these costs, although costs might be incurred to destroy weapons. Second, and more significant, disarmament involves adjustment costs resulting from the release of resources from the armed forces and from defence industries (see chap. II, fig. II). There are, for example, costs of demobilizing and re-employing (or not) military manpower and the resources released from defence industries. There will be effects on resource allocation in the form of labour, capital, raw materials, services, energy and management at the economy, industry and firm levels, the effects differing between regions and between the short and the long term.

138. A simple framework for identifying the costs of disarmament is presented in figure V (the long-run benefits are discussed in part three, chap. X). This figure shows the economic impacts of defence cuts on the armed forces, on defence industries, and on industries supplying the defence sector, as reflected in the release of manpower, the closure of defence bases and defence plants, and cut-backs in the industries supplying such bases and plants. Such effects will have a local or regional dimension. Thus, there are both direct and indirect implications for national economies. There will be direct impacts associated with the release of resources for alternative uses, as well as indirect effects in such forms as cut-backs in the output and employment of supplier industries and the impact on technical spin-off between the defence and civil sectors. There could also be a possible shift in the culture of defence firms from dependence on Governments to an enterprise culture based on entrepreneurship, risk-taking and responding to market forces (Hartley and Hooper, 1991).

Figure V. The costs of disarmament


Cuts in defence spending
Armed forces
Cuts in:
Military manpower (numbers, skills)
Civilians employed by forces
Base closures
Withdrawal of foreign forces
Impact on defence industries and defence plants and on industries supplying armed forces:
Job losses
Plant closures
Effects on supplier network
Conversion-diversification
Location effects
Towns, regions
Release of resources for other uses:
Manpower - which skills?
Land
Facilities (bases,plants)
Problems
Unemployment of labour
Unemployment of capital
Location effects
Time period for adjustment
Public policy
Assisting reallocation of resources
Conversion
Retraining
Retooling

139. Questions then arise as to how well and how quickly market and centrally planned or transitional economies can adjust to cuts in defence spending (transitional economies are economies which are abandoning administrative allocative mechanisms and moving to market systems). Answers to this question influence whether there might be a role for public policy: if so, should policy focus on assisting the reallocation of resources from declining defence sectors to other parts of the economy, or should it assist defence contractors to convert to civil activities? Some of these adjustment problems are likely to be even greater in the former socialist and centrally planned economies of Eastern Europe and the former Soviet Union, where efforts at converting defence industries are being made simultaneously with privatization and moves to a market economy. But these adjustment problems are not new, nor are they confined to defence. The civilian economy has a long history of adjusting to change. Moreover, major reductions in defence spending have occurred previously, such as following the end of the First and Second World Wars. However, such previous experience might not be useful for the current situation. Defence cuts are now taking place in a situation of peace without a buoyant demand for civilian products, in contrast to the situation after the Second World War. In addition, since 1945 defence firms have become much more specialized, relying on technologies which are less adaptable and useful for civilian purposes so that less product substitution is possible.

140. A framework of the type outlined in figure V provides a starting-point for evaluating the costs and benefits of cuts in defence spending. The role of public policy in minimizing the short-run adjustment costs and maximizing the long-run benefits of the investment in disarmament is considered in part three. This chapter focuses on adjustment costs and figure V identifies the questions which need to be addressed by economists, researchers and policy makers for a sensible debate and informed public choices. In some cases, there are research results providing answers to questions; but often there is a lack of satisfactory analytical and empirical work to provide adequate answers, although some of the gaps in knowledge reflect the lack of actual experience of disarmament (Hartley and Hooper, 1990b). None the less, some of the policy-relevant questions relating to the adjustment aspects of disarmament can be identified:

(a) Which industries, regions and localities are especially vulnerable to cuts in defence spending resulting from disarmament? Cuts will affect firms and industries and their supplier networks dependent on defence markets, and will involve the closure or run-down of military bases with adverse impacts on spending power in towns and regions (Paukert and Richards, 1991);

(b) Which types of labour and skills and in what numbers will be released by the armed forces, defence industries and their supplier industries, and where will the employment reductions be located?

(c) How marketable are the labour and capital resources that are released? For example, some of the labour skills of military personnel are highly specific with value only to the military, such as torpedo and missile operatives and tank gunners. The value of general skills acquired from military service which may normally be sought by civil industry might be reduced by the sudden availability of large numbers of ex-servicemen on the job market. Similarly, some defence facilities such as rocket factories and submarine yards might be highly specific to defence uses, whilst other plant and facilities can be readily and cheaply converted to civil use. Examples include military airfields which can be converted to civil airports and aircraft factories that can manufacture civil airliners instead of combat aircraft.

141. In the rest of this chapter, these issues are examined, in two stages. First, a production function approach is used in which the adjustment problems facing labour and capital as inputs into the military production function are considered. Here, a distinction is made between military and civilian manpower, and between military and civilian capital. Second, the experience of conversion in market, transitional and developing economies is examined.

D. Adjustment problems: labour

1. Manpower adjustments

142. Defence expenditure is an important source of employment for market, centrally planned or transitional economies in both industrialized and developing countries. It results in the employment of personnel of varying skills in the armed forces, civil servants in defence ministries, scientists and technologists in government defence and private sector research establishments and professional, skilled and unskilled workers in industries supplying defence equipment, construction work and other goods and services (see chaps. IV and V). The true total of jobs dependent on defence spending will include those directly and indirectly employed. Examples include those in the supplier networks (e.g., suppliers of aluminium to aircraft firms) and those whose jobs depend on the spending power of the armed forces and defence producers, including communities where defence contractors and military bases are the sole or main source of employment. Such a diversity of direct and indirect impacts makes it extremely difficult to obtain accurate data on the total employment effects of defence spending (see chap. IV). Indeed, there is a lack of detailed information on supplier networks, on the geographical location of suppliers to defence prime contractors, their dependence on defence sales and their importance in local labour markets (Paukert and Richards, 1991; Hartley and Hooper, 1990b). Similarly, data are generally unavailable on the importance of national and foreign military bases in their local labour markets (Sharp, 1990).

2. Military manpower

143. One of the major implications of disarmament is a move towards smaller armed forces. As a result, substantial numbers of military personnel will be released on to the labour market. Their employment prospects will depend on the magnitude of the force reductions, the period of time over which the

manpower cuts occur, the marketability of their skills and the general state of the economy into which they are released. Massive manpower cuts occurring quickly in an already depressed and high unemployment economy will cause the greatest dislocations and impose the greatest adjustment costs.

144. The prospect of having to find new employment after a lifetime in one occupation, and perhaps in one company, poses significant personal adjustment problems for many workers. Such adjustment problems are likely to be as great, if not greater, for long-term professional military personnel. Professional soldiers and officers with a lifetime of experience in the armed forces will have acquired a set of attitudes and values which might not transfer easily and quickly to the different culture and requirements of civilian firms and organizations (e.g., disciplinary requirements differ). On the other hand, some professional servicemen typically face a mid-career break, with recruits often serving for less than a normal civilian working lifetime. Similarly, for conscript forces the period of service is much shorter, up to two or three years. Thus, for some armed forces personnel, the expectation of a change in career may make the transition somewhat easier than was the experience of workers in civil industries which suffered a rapid rundown.

145. The employment effects of reducing manpower in the armed forces will depend in part on the skill mix of those released. Some military personnel acquire skills which are highly marketable and transferable to the civilian economy. Examples include transport aircraft pilots, engineers, computer operators, vehicle mechanics, drivers and medical personnel. Other military personnel have skills that are highly specific and not transferable, with value only to the armed forces, such as missile operators, paratroopers and the crews of nuclear-powered submarines. For these groups with non-transferable skills, disarmament renders their human capital obsolescent. Elsewhere, many servicemen, particularly those who enter without formal qualifications, benefit in later civilian life from the training received during military service. Much of the empirical evidence on the civilian employment experience of military personnel relates to United States servicemen, where the results are somewhat mixed (Hartley and Hooper, 1990b). Some evidence suggests that there is little difference between the benefit obtained from military service and that from civilian training. Other studies suggest that the benefits of military training are greater for disadvantaged and minority groups (Browning et al, 1973). The importance of military service and training for future employment and income is also affected by the state of the labour market at the time of re-entering the civilian workforce. For example, Viet Nam war veterans re-entering the labour force fared less well compared to their non-veteran competitors than those leaving the services after the Korean war. This difference reflected the rapid changes which had occurred in the civilian workforce, lost seniority and the depressed state of the labour market (Berger and Hirsch, 1983).

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3. Civilian employment

146. Disarmament will reduce the demand for labour in the defence industries and their supplier industries. As a result, the manpower released by the armed forces will be seeking to re-enter employment at the same time as defence industries are also releasing workers on to the labour market.

147. Like other forms of expenditure, military spending generates and supports employment. However, questions arise whether its employment effects are different and distinctive. Studies of the relationship between military spending and unemployment suggest that at the aggregate level no special account needs to be given to defence expenditures. On this basis, it is unlikely that reductions in the share of defence spending in national output will be associated with higher average levels of unemployment compared with reductions in other forms of spending (Dunne and Smith, 1990a). There will, though, be localised impacts on those towns and local communities highly dependent on military expenditures resulting from either defence firms or military bases (Richards, 1990).

148. A Congressional Budget Office study of the United States estimated the economic effects of the Administration's 1991 plans for a real reduction in defence spending of 20 per cent between 1991 and 1997. As a result of both job losses in the defence sector and job gains in the civilian economy (via a reduced deficit), it estimated net employment losses of about 300,000 by 1995. Within this net change, there is an estimated loss of some 1.1 million defence-related jobs by 1995, comprising 400,000 direct defence jobs and a further 200,000 indirect job losses in supplier industries. The defence industries which are likely to experience substantial job losses include tanks, missiles, shipbuilding, aircraft and ordnance. At the regional level, the study estimated that even for the most defence-dependent States, the short-run adverse effects of 1991 defence cuts would be relatively modest, although a few local communities would suffer serious adverse effects in the short run (e.g., the closure of Fort Ord, Monterey; Bath Iron Works, Maine: United States, Congressional Budget Office, 1992.)

149. For the United Kingdom, simulations have been undertaken into the employment effects of cutting the defence budget by 50 per cent by the year 2000, requiring cuts at an annual average rate of 8 to 9 per cent, eventually resulting in a defence budget equivalent to 2 per cent of GDP. Under this model, without any compensatory expenditure, the result would be a fall in national output and a rise in unemployment of over 460,000. But, if the expenditure released from defence cuts were used for other government spending such as education or health, the net effects would be higher output and a reduction in unemployment of over 500,000 (Dunne and Smith, 1990b). However, the aggregate changes suggested by this model conceal major problems for some industries, regions and towns heavily dependent on defence spending. Clearly, some of the employment impacts will initially depend on how firms respond to disarmament.

E. Adjustment problems: capital

150. Disarmament will have major impacts on the capital employed in defence research and manufacturing plants and in defence bases. Defence firms have to decide whether to remain in the defence market, to seek new products for their existing plants, to rebuild and re-equip their plants, or to sell them. In market economies, much will depend on whether the capital (plant and equipment) is specific and non-transferable to other civilian uses: converting a highly specific defence plant to some other civilian use might be so costly that it is not worthwhile. However, firms in market and other economies can adopt a variety of responses to maintain the value of their capital.

1. The response of firms

151. The 1990 CFE Treaty and subsequent unilateral initiatives have led to cuts in military spending and changes in the balance of armed forces which will have significant implications for the size, structure, composition and performance of defence industries. Smaller armies, navies and air forces will reduce the demand for land, sea and air equipment with major impacts on the supplying industries. However, whilst the volume of defence business in NATO and the former Warsaw Pact States will decline, there are likely to be some new growth markets resulting from a shift towards defensive rather than offensive forces (e.g., greater emphasis on surveillance, early warning and defensive missiles). The arms limitation process itself will also create new markets associated with inspection, verification and the disposal of surplus military equipment, such as nuclear weapons.

152. Defence contractors will respond to cuts in various ways. They will search for new military or civil business, or they will adapt to a lower output and await future new defence orders. Export markets are likely to become more competitive as European, United States and former USSR firms respond to defence cuts and the prospects of excess capacity by seeking foreign markets, possibly with state support. However, following the Gulf war, there might be international efforts to regulate the arms trade, particularly arms shipments to the Middle East (see chaps. VI and VII).

153. Likely reductions in domestic and foreign market prospects will lead to plant closures, job losses and exits from the defence industry as well as to national and international mergers. These changes will intensify the trend towards a smaller number of large international defence contractors with a range of civil and military activities.

154. In considering their response to defence cuts, firms will be motivated by both survival and profitability. In the short run, their adjustment will be constrained by factor fixities and contractual commitments. They have to operate with existing plant and labour and their locations, and with existing markets and distributional systems. It takes time to close down a plant and to declare large numbers of workers redundant. Similarly, it takes time to

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rethink a firm's strategy and to identify new profitable markets which might utilize the firm's competitive advantages. In the long run, everything can be changed, including the size of the plant, and the most efficient adjustments can be made. Thus, labour, especially variable labour without long-term contracts, is most likely to bear the immediate costs of adjustment, for example, via reduced hours of work, followed by job losses. Plant closures will take longer to organize since firms will need time to reorganize the geographical distribution of their business, selecting for reorganization or sale those sites which are marketable for other uses. Another short-run response will be to seek additional sales in the firm's existing markets, to withdraw work from subcontractors and to obtain subcontract business. In the longer term, say over three to five years, a firm can invest in the costs needed to enter completely new military or civil markets and it can decide whether to enter such markets by internal expansion or by merger or take-over.

155. At the same time, contractors and other groups likely to lose from disarmament will lobby Governments to oppose defence cuts and to modify their policies. They will seek to delay or revise the policy changes; they will demand state support or compensatory civil work such as launching aid for civil aircraft or subsidies for merchant shipbuilding, and insist that the Government offers generous compensation to the losers. Here, it has to be recognized that some public policy measures might actually prevent efficient and socially desirable resource reallocations, and might be used for the continued costly support of established and inefficient producer interest groups (see chap. XI).

2. Military capital: converting defence facilities

156. Reductions in the size of the armed forces will result in base closures. The armed forces will no longer require as many air bases, army garrisons, training establishments, naval dockyards and their supporting facilities. Already, following the 1990 CFE Treaty, and unilateral initiatives, the reductions in force levels throughout Europe have led to the closure of a number of defence facilities resulting from the withdrawal of United States, United Kingdom and former USSR overseas forces. Some of these bases are often major components of the local economy, located in areas where there are few alternative employment opportunities: hence their closure can have a serious impact on civilian employment and on the amount of spending power in the local economy. However, base closures are not unique to the 1990s or to the military sector (United States, Congressional Budget Office, 1992).

157. There were large-scale base closures following the end of the Second World War. Since then, many of these surplus bases have found other uses (i.e., the capital is transferable). Some former air bases have become airports; some sites have been converted into trading estates or prisons or storage facilities (e.g., for agricultural products); some have been redeveloped for housing and shopping centres, whilst others have returned to agricultural use. In market economies, surplus defence facilities will have a market price reflecting their alternative use value, including the costs of clearing the site of highly specific defence facilities with no

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alternative-use value. But similar adjustment problems occur in the civil economy. It is not unknown for local communities to have to adjust to the closure of a major employer in the town, such as a local mine, steel plant or shipyard. Success or failure in adjusting to change will depend on the overall state of the economy, on how well and how quickly the local economy can adjust to change and the contribution of public policy (see part three). However, adjustment problems for both labour and capital are likely to differ between different economic systems.

F. Adjustment in different economies

1. Conversion in industrialized market economies

158. Previous experience in the industrialized market economies of North America and Western Europe suggests that very few defence manufacturing establishments will convert in the sense of making fundamentally the same product for a civilian market. Possible exceptions include military and civil aerospace products, including aircraft, engines, helicopters and space satellites, and shifting from warship building to merchant ships. The potential for suppliers and component makers to convert in this sense is greater than that for prime contractors. For example, suppliers of tank track can quickly adapt their plant and workforce to produce track for earth-moving equipment. Some firms will attempt to use the technology, resources and skills developed for defence production in new civilian areas. Such efforts will face four major difficulties:

(a) Many defence companies are specialists, not used to operating in cmpetitive civil markets. Their production facilities, workforce and culture are highly specific to defence. The process of obtaining and fulfilling orders, the contract procedures, standards and all aspects of doing business differ between the defence and civil markets. Some defence companies have become defence specialists because of the benefits of specialization: they are good at defence work, which involves a different culture from civilian work (Melman, 1970);

(b) The need to identify civil markets and products which can be made using the resources available to specialist defence contractors;

(c) The need to identify profitable civil markets. Questions arise why, if there are potentially profitable civil markets available to be exploited, existing firms have not already moved into these markets;

(d) The difficulty of conversion in a recessionary period. Even where firms are able to switch their plant and workforce quickly and easily from defence to civil production, they might be prevented by a recession in the civil sector of the economy.

159. A simple framework can be used to assess the prospects for converting industrial capacity from military to civil work. Two characteristics are

important. First, a firm's dependence on defence sales with reliance on a single customer, non-competitive cost-based contracts, State-funded research and development, a protected market, guaranteed profits and a culture of dependency rather than a culture of enterprise (Melman, 1970). Second, a firm's dependence on defence-led and defence-specific technology. Some defence technologies have extensive civil applications, such as radar, aircraft and avionics; others have few, if any, direct civil applications, for example, stealth, armour and nuclear weapons (see chap. V). Figure VI outlines an analytical framework which provides a starting-point for assessing the prospects for conversion (Dussauge, 1987). Firms in region A are the ones where conversion is easiest and most likely. In contrast, firms in region D face the greatest difficulties of conversion: defence sales dominate their business, and they depend on defence-led technology which is highly specific to the defence sector (see chap. IV for details of firms dependent on defence sales).

Figure VI. A framework for conversion

		Dependence on defence sales	
		Low	High
Dependence on defence-led and defence-specific technology	Low	A relatively easy	B
	High	C	D most difficult

160. For specialist defence firms wholly dependent on defence business, direct conversion is technically difficult, costly and probably not worthwhile. For such enterprises, the plant, equipment, managers and workforce are highly

specific to defence and non-transferable - at least at reasonable cost. In such circumstances, it is probably most efficient to close the specialist defence plant and, if there are willing buyers, redevelop the site for other purposes, such as, housing, industrial estates or shopping centres.

161. Advocates of direct conversion for specialist defence plants often claim that there are many civil market opportunities available to such firms. Rarely do they address the following problems:

(a) The costs of converting defence plants and retraining the workforce;

(b) The costs of entering civil markets;

(c) Whether the civil markets are expected to be profitable.

162. If these advocates of conversion are right and there are many opportunities not already being exploited by existing specialist civil firms, then there is the ultimate capital market test, namely, defence firms will be taken over or their defence plants will be marketable for other uses. In other words, when defence plants are offered for sale, they will be bought by firms that believe they can find a profitable use for the assets. Typically, however, what happens is that the original defence plant and its site are redeveloped for more appropriate alternative uses. In the meantime, though, the labour released will either be unemployed and might require retraining, or it will be re-employed elsewhere in the economy (depending on how well local labour markets work: see studies of London, Michigan, Munich and Rome in Paukert and Richards, 1991).

163. Contrary to the assumptions of conversion advocates, adjusting to change takes time: it is neither instantaneous nor costless. Much depends on civil market opportunities but, typically, an adjustment period of up to five years might be needed. Nor should the conversion debate be dominated by the large defence prime contractors. For suppliers and subcontractors, direct conversion is less of a problem. Typically, these are firms where defence might be only part of their total business, or with resources that could be used flexibly and interchangeably between military and civil work. Examples include foundries and castings which can make products for either defence or civil business; and gear boxes for tanks can be used for tractors and heavy vehicles.

164. Among prime contractors, there are possibilities for direct conversion, using the firm's defence resources to produce civil goods. Aerospace is a good example, where a firm's plant and labour force are transferable and can be used to manufacture either military or civil aircraft, helicopters and aero-engines. Other examples of conversion have been less successful. For instance, the effort of Vickers (United Kingdom) to convert from tanks to tractors after 1945 was a financial failure simply because Vickers was unable to compete with the existing specialist tractor firms (Hartley and Hooper, 1990a). There are good reasons for such failure. Vickers is a defence specialist able to compete and survive only in its specialist market.

Similarly, tractor firms have survived by establishing a competitive advantage in their specialism. If there are profitable opportunities in civil tractor markets, there is every reason to expect the established tractor firms to have identified and exploited such opportunities. Defence firms seeking direct conversion have to identify profitable civil markets which are appropriate for their resources. In many cases, however, the resources and skills of defence firms are highly specific and non-transferable: hence the need for appropriate retraining and possibly retooling programmes for both labour and capital.

165. There is a related cultural adjustment problem for specialist defence firms, particularly those wholly dependent on defence work. Difficulties arise in changing the culture of an enterprise from demanding defence requirements to the different requirements of civil markets. For example, defence products are often of high quality and such products are difficult to sell in civil markets where quality standards are different. In specialist defence firms, the Government dominates and determines the firm's culture and that culture tends to be one of dependence on the Government rather than an enterprise culture responsive to changing market demands. It is not unknown for defence contractors in non-competitive markets to be criticized for high costs, cost escalation, delays, unsatisfactory equipment performance, waste and excessive profits (Hartley, 1991a).

2. Conversion in transitional economies: the case of the former USSR

166. In principle, conversion in centrally planned economies involves the same issues of reallocating resources from defence to civil activities. However, the allocative mechanisms differ, with market economies relying on private ownership and price signals in the markets for goods and services, and for factor inputs of land, labour, capital and enterprise. In centrally planned economies, allocative decisions involving what to produce and how are made by the State's central planning agency. The former USSR, though, is now in a transitional stage, moving from a centrally planned to a market economy which creates even greater problems for conversion and adjusting to defence cuts (Paukert and Richards, 1991).

167. To reflect the political and military realities in the former USSR, it is important to analyse conversion as a two-stage process. The first period is from 1989 to the coup d'etat of August 1991. The second period is from late 1991 and includes the creation of the Commonwealth of Independent States by the former Soviet Republics. These two stages of conversion differ substantially both in scale and in methods of resource allocation.

168. The first conversion stage started with the unilateral disarmament measures announced in 1988 involving cuts in armed forces manpower, and reductions in spending on defence research and development, equipment procurement and on the total defence budget. The potential scale of the conversion task was massive, with estimates of 12 million people employed in

the defence and adjacent industries, equivalent to about one third of total employment in manufacturing industries in the USSR. Some 700 enterprises were announced as involved in conversion, about 50 per cent of them reducing defence output by more than 20 per cent, and it was proclaimed that the share of civil output in the total output of the defence industries would increase from 43 per cent in 1988 to 65 per cent in 1995. In reality, the conversion became a political slogan, its projects were mainly tailored by the military-industrial complex to protect its interests, leaving large defence production units unaffected. Such conversion was presented falsely to the public of the former USSR as a speedy and effective means to overcome mounting economic and social problems in the country.

169. Two targets were announced in the 1990 State Programme of Defence Industry Conversion: first, to increase the output of consumer goods and equipment necessary for the production of food, clothes, housing and health services (i.e., targets for an eventual peace dividend in the form of television sets, washing machines, refrigerators, health care, housing etc.); second, to promote technical progress in key sectors, especially in electronics, computer technology, communications, civil aviation, civil shipbuilding and space. In all drafts and in its final form the programme was based on centralized planning and management which gave enterprises assignments to produce completely new products. It became known as the non-market programme because of its reliance on the traditional administrative and command system, with bureaucratic control, an indifference to production costs, centralized regulation of production and distribution of state orders, and command assignments to change production lines (Bougrov, 1989).

170. The first stage of conversion in the former USSR has been characterized by both the scientific community and the press there as a complete failure. This experience of conversion shows how military plant and equipment has limited application to new civilian uses. To convert defence plants requires new equipment (often from abroad), a new organizational culture (away from dependence on unlimited defence contracts and generous benefits), retraining of managers and the workforce to produce alternative civil products, a need for market research and a willingness to take risks in developing new products. However, during the adjustment process, the State provided employment and income guarantees. For example, between 1990 and 1991, defence cuts required more than 500,000 workers to change their jobs, but the majority stayed with the same firm and transferred to new jobs created by expanding civil output. It was also recognized that the conversion-adjustment process would take possibly four to five years and would involve major investment costs, all of which meant that any peace dividend was a long-term prospect.

171. The second stage of conversion, starting in late 1991, is highlighted by the fact that the procurement of weapons and military equipment, which had already declined by 30 per cent in 1990 and 1991, will be further decreased in the Russian Federation by more than 50 per cent in 1992. Such a radical cut in government military purchases, leading to a major transformation of the defence industry and its far-reaching reorientation to civilian output, is being referred to as a "landslide" conversion by Russian professionals and the public at large.

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172. The second, in many respects new, stage of conversion promises to be more realistic and fruitful despite enormous difficulties. Defence production in the Russian Federation has been placed under civilian control and is to be radically reformed within a unified Ministry of Industry. Conversion law has been adopted regulating the expected growth of unemployment, income losses and other social issues during the drastic demilitarization of the Russian economy. The Russian defence establishments, pressed by severe economic and financial hardships, have openly expressed their readiness and willingness to enter the emerging market economy and to act in its competitive conditions. They have made their choice in favour of creating stock, leasing, joint, small and other market-oriented companies. Active but limited government involvement in the conversion process has included tax, credit and depreciation incentives and other tools, including competitive bids for state civil contracts. The idea of a unified state conversion programme or national plan is rejected in the Russian Federation as a poor substitute for practical projects initiated and implemented by the converting enterprises.

173. For the Russian Federation, Ukraine and other members of the Commonwealth of Independent States, the adjustment process is further complicated by its twin-track approach to change. It involves seeking to undertake conversion while at the same time trying to create a private enterprise market economy. One of these tasks is difficult enough; to undertake both simultaneously represents a massive challenge. Here, there might be a role for other States and the international community in organizing an international aid programme to the Commonwealth of Independent States which would provide technical advice, equipment and training to assist the transition to a peace-time market economy. Such an aid programme might be funded by the parties to the 1990 CFE Treaty. Whilst it would absorb some of the future peace dividend available to NATO States, it would be worth while, particularly if it prevented a return to the cold war arms race.

3. Conversion in developing economies

174. Some of the problems of conversion and adjustment in developing countries will be similar to those in market, centrally planned and transitional economies. There are, though, some distinguishing features of the adjustment problems in developing countries. Typically, developing countries have most of their defence sector employment in the armed forces (see chap. IV). Thus their adjustment problems will involve either releasing military personnel on to the labour market or, in the case of conscription, not recruiting labour. In the short run, the result is likely to add to the substantial employment and unemployment problems of developing economies. There are also likely to be implications for accommodation and for the provision of social services previously supplied by the armed forces. Such problems have occurred in the former USSR as its forces based abroad have returned to their home country. However, those developing countries with centrally planned economies might be able to minimize unemployment by reallocating military personnel to alternative civil occupations. In contrast, those developing countries with market economies might experience greater adjustment problems if they have to

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rely upon limited labour markets which are restricted geographically and which fail to generate appropriate market price signals.

175. Some developing countries have a substantial defence industrial base, particularly China, India, Egypt and Brazil (see chap. IV above and Renner, 1991). In those countries where defence companies and their plants have been created as specialist defence plants, without any civilian activities, conversion is considerably more difficult. An example might be Hindustan Aeronautics, India, where arms sales form 97 per cent of its total sales. Similar examples have occurred in the former USSR, where the adjustment problems are even greater within the "closed cities" which were wholly dependent on military activities, such as Chelyabinsk 65, east of the Urals. There is a further dimension for those developing countries with a defence industrial base. Some are among the world's largest arms exporters, including Chile, China, Egypt, the People's Democratic Republic of Korea and the Republic of Korea. For those countries, the loss of arms exports would have an immediate impact on their ability to earn scarce foreign currency. At the same time, the loss of its domestic defence industry might be seen as having a major adverse effect on the ability of a developing country to achieve economic growth through promoting its technology base. Here, though, it needs to be recognized that there are alternative ways of promoting high technology in the civil sector. Possible examples include support for research and development in the agricultural sector, the development of a civil aircraft industry to improve internal communications and joint research and development projects with developed countries.

G. Conclusion

176. Disarmament involves major adjustment problems and costs for the real resources of labour, management and capital, and their associated inputs of raw materials, energy and supporting services. Labour and capital face similar adjustment and conversion problems in terms of whether the resources can be transferred easily and quickly from military to civilian markets. Some resources are highly specific to the military sector and are non-transferable. These raise the greatest adjustment problems, particularly for labour with its potential for suffering and hardship associated with the loss of income due to job loss. Here, there is a role for public policy to assist change through such policies as manpower retraining, capital retooling, and the provision of information on job opportunities (see chaps. X and XI).

177. Different types of economies also encounter different types of adjustment problems. Probably the most difficult adjustment problems occur in developing countries with a large defence sector and in those economies such as the former USSR where the institutions of central planning have been abandoned and those of a market economy have not yet been established. For all economies, it is also apparent that the adjustment costs will be higher if large-scale disarmament occurs during a recession in the economy. In the longer term, though, disarmament leads to economic benefits as the resources released from the military sector are reallocated to produce civil goods and services: this is the peace dividend. To maximize society's rate of return from disarmament requires that the adjustment costs be minimized and the benefits maximized.

Part Three. Conclusions

X. THE PEACE DIVIDEND

A. Introduction: the key issues

178. Peace itself is one of the first dividends of peace. In addition, there are economic benefits of disarmament which are often described as the "peace dividend". This is a term which has been surrounded by a variety of myths which need to be analysed and assessed critically. In this report, the peace dividend is viewed as an investment process in which present costs are incurred in the expectation of future benefits. On this view, the dividends of peace are likely to be small in the short run and dominated by the adjustment costs involved in unemployment and the reallocation of resources from military to civilian uses needed to obtain benefits in the long run in the form of a larger output of civilian goods and services.

179. The size of the long-run benefits from disarmament will depend upon how the resources released from the military sector are utilized. They can be reallocated to improve the nation's stock of physical and human capital, for example, via education and training, or they can be used to increase consumption, each of which will have different long-run impacts on a country's GNP (A/9770/Rev.1; UNIDIR, 1984). In this chapter some of the myths surrounding the peace dividend are examined and alternative future scenarios are explored for industrialized market economies, for the former socialist, now transitional, economies of Eastern Europe and the former USSR, and for developing economies.

B. The peace dividend: myths and reality

180. The nature of the peace dividend can be understood at three different levels:

(a) As a simple reallocation of public expenditure from defence to other budget headings, which can be called the uninformed level;

(b) As perfect substitutability between defence and other economic activities, which can be called the simple level;

(c) As requiring a major reallocation of resources involving costs and taking time: adjusting to change is not instantaneous. This is the informed level which recognizes the costs and complexities involved in reallocating resources and identifies both short-run costs and long-run benefits.

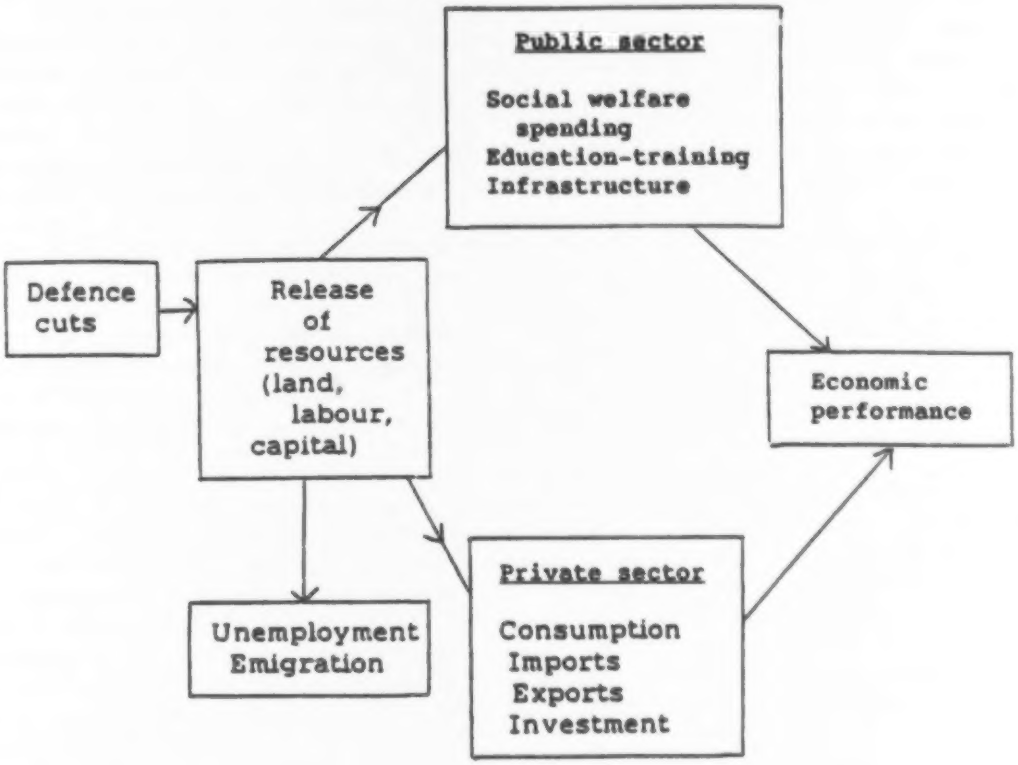
181. At least four myths surround the peace dividend. First, it is reputed to be large and available instantly. According to this myth, disarmament leads to an immediate peace dividend which can be paid out to the citizens of the disarming country or used in some other way, such as reducing taxes, paying

off the national debt, building or rebuilding infrastructure or funding social services, or it can be transferred to a development fund for developing countries. This naïve view at the uninformed or simple level treats military expenditure as a category of social spending which can be shifted to another category, like shifting money from one pocket to another. It ignores the fact that conversion and adjustment entails a fundamental reallocation of resources in the economy, with real adjustments to be made in employment patterns, capital utilization, in the size and structure of industries and in land use.

182. The second myth is that the peace dividend will solve a country's economic and social problems. It might help, depending on the size of the dividend and how it is used. For example, will it be used for public or private consumption or for investment? However, there is a danger that analysis of the relationship between defence spending and poor economic performance will confuse correlation with causation. Even a simple and illustrative model shows that the possible relationship between disarmament and economic performance involves a complex set of linkages, as shown in figure VII. At the outset, defence cuts will produce budget savings which may be used to meet alternative demands for government expenditure (e.g., health or education) or returned to citizens in the form of lower taxation. These financial adjustments will lead in turn to changes in the flows of real (physical) resources of land, labour, capital and enterprise in the economy. Manpower of varying skills will be released from the armed forces and from defence industries; and capital will also be released in the form of surplus military bases and defence manufacturing facilities. The resources will in most cases initially be unemployed, and then eventually be taken into alternative uses in the public or private sectors as in the informed view of the peace dividend. The extent to which the peace dividend is likely to affect economic performance (employment, growth, inflation etc.) depends on how it is allocated between the public and private sectors and between investment and consumption. Allocating the peace dividend to private investment in new plant and machinery, or to public investment in education and training (human capital) and infrastructure may be more likely to improve economic performance, particularly growth, compared with expenditure on, say, social welfare payments, although these will contribute to social objectives.

183. The third myth is that of the collapsed economy or the catastrophe scenario. According to this myth, disarmament would lead to an irreversible economic downturn, the assumption being that the economy is completely dependent on military spending. This cynical view ignores past successful conversions following major wars, showing that economies can adjust and adapt successfully to disarmament and reap the rewards of greater civil output. It ignores the fact that for NATO countries, at least, military spending represents a relatively small share of total output, amounting to less than 6 per cent of GDP in 1991. It also ignores the fact that adjustments to major changes in markets are not unique to defence industries. Civil industries in Europe and North America, for example, have experienced significant adjustments following the decline in their basic manufacturing industries, for example, coal, steel, shipbuilding and textiles.

Figure VII. Defence and economic performance



184. The fourth myth is that adjustment problems and costs will be relatively small and localised, so that effectively they can be ignored. In fact, adjustment problems and costs may be substantial and long lasting for certain groups and communities likely to lose from disarmament, particularly in a period of recession. Without adequate adjustment policies, such as manpower and regional policies, these groups will suffer significantly from disarmament and could form barriers to change (see chap. XI).

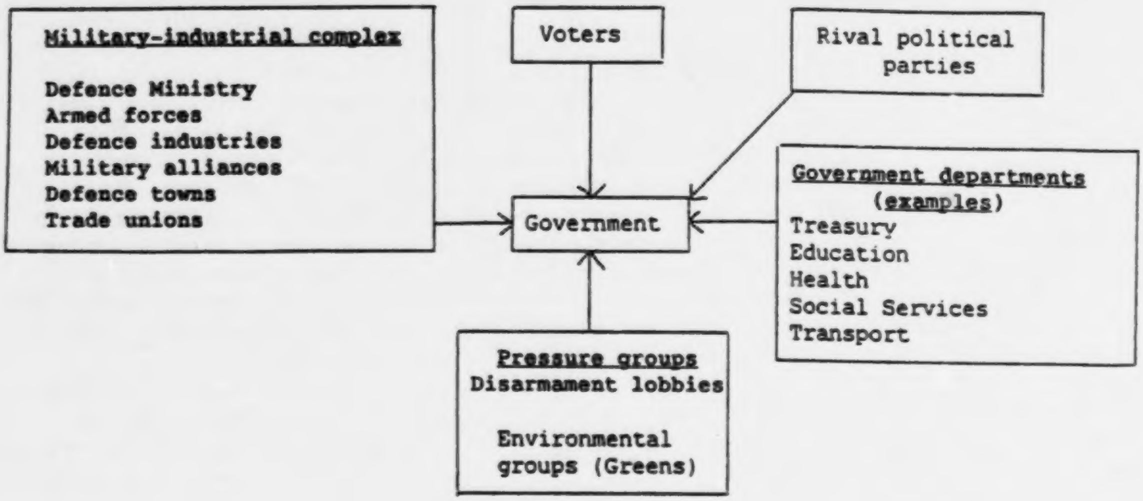
C. Barriers to change

185. Disarmament will, in some cases, be opposed by those groups that believe that they will lose from the policy, namely defence ministries, armed forces, contractors, regions and towns which depend on military spending. For instance, NATO defence ministries and the armed forces seeking to protect their budgets will stress the need to maintain strong defences, pointing to continuing security threats, general uncertainties about the future, and the prospects of new risks, for example, from international terrorism. Scientists and trade unions will be concerned about the technological, employment and social consequences of cancelling major equipment projects. Concern will also be expressed about the economic and social consequences of closing military bases in remote rural areas lacking alternative job opportunities.

186. To protect themselves against substantial cuts, defence ministries and the armed forces will promise efficiency improvements in the form of competition, civilianization, rationalization and international collaboration. They will also offer siseable future cuts in planned spending, always hoping for a change in government or the emergence of a new threat. The armed forces will try to protect their traditional property rights and their prestigious and glamorous high technology weapons projects. Faced with cuts, the forces are likely to economise on training, support functions, stocks, reserve forces and civilian manpower rather than sacrifice their major new equipment programmes. For example, aircraft carriers, air superiority aircraft and main battle tanks will be preferred to support ships, transport aircraft and trucks. Threats in the rest of the world will increase the requests of the armed forces for appropriate equipment and capabilities, such as amphibious forces. Faced with cuts, the armed forces are likely to press for the scrapping of old equipment, a reduction in current orders and the concentration on the development of the next generation of equipment needed to ensure their capability to fulfil a new and changing role. Likely reductions in manpower also imply increased reliance on, and hence a need for, sophisticated equipment. In effect, the military will demand a share of the peace dividend to ensure that their smaller forces are better equipped for their new and changed roles, so that they are more capable of protecting the national interest (Hartley, 1987).

187. Other interest groups likely to suffer from defence cuts will lobby for the policy to be changed and will also demand compensation. Examples include towns dependent on defence companies or on military bases. Vote-sensitive Governments seeking re-election might find it difficult to ignore such requests for assistance. All of which reinforces the point that even if substantial savings on defence expenditure are possible, adapting the armed forces, local economies and labour markets to changed circumstances might not be cheap. Some of the interest groups with different views and beliefs about disarmament are shown in Figure VIII. Viewing disarmament as an investment process means that, in the long run, society benefits, but at the price of short-run adjustment costs.

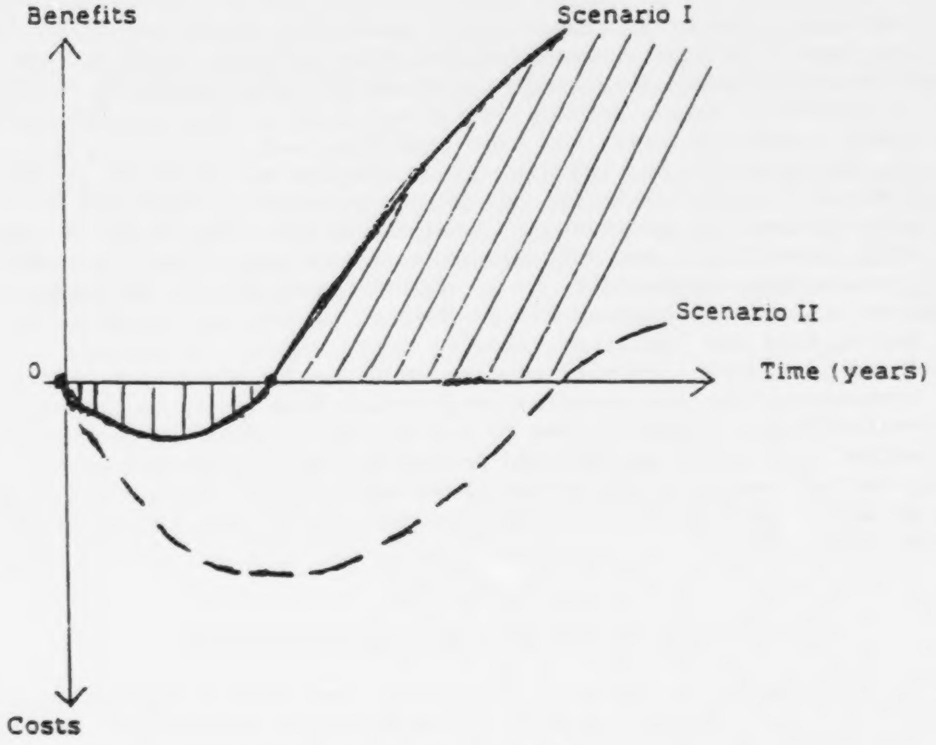
Figure VIII. Interest groups and disarmament



D. From peace investment to peace dividend

188. All investments involve possible successes and failures. The benefits of disarmament as a good or bad investment will depend on factors such as the state of the economy and how well the change is managed by Governments. The costs and benefits of disarmament as an investment process are shown in figure IX. Scenario I represents a successful investment, with low costs incurred over a short period of time, followed by substantial benefits, resulting in a high social rate of return from disarmament. The low costs might reflect successful government intervention through manpower policies embracing retraining programmes, geographical mobility, the provision of information and so on. Scenario II represents a poor investment, involving high costs over an extended number of years followed by relatively low benefits, resulting in a low or even negative social rate of return from disarmament. In this scenario, the high costs might reflect an economy which relies on market forces alone for adjustment, where these have to operate in a recessionary period. The analysis in figure IX provides a framework for considering alternative future scenarios in different economies.

Figure IX. The costs and benefits of disarmament



E. Future prospects: the industrialized market economies

189. For the industrialized market economies of North America and Western Europe, long-term sustained gradual reductions in military expenditures in conditions of economic expansion with tight labour markets and large sums available for investment in new plant and equipment, combined with government policies of manpower retraining, assistance to military personnel and defence workers in finding new jobs and assistance to defence-oriented industries and plants in identifying new market opportunities would lead to low costs, a short transition time (between costs and benefits), and high benefits, and thus a high return from disarmament, as occurred, for example, in the United States in the period after the Second World War. By contrast, short-term episodic reductions in military expenditures in conditions of economic recession with high rates of unemployment and relatively small sums available for investment in new plant and equipment would lead to high costs, a long transition time, and low benefits and thus a low (or even negative) return from disarmament, especially when combined with either a lack of government action to address these problems or wasteful government bail-out subsidies to unemployed workers and affected industries or regions. Unfortunately, it would appear that this negative result is where the United States and other NATO countries are heading, with no peace dividend, unless policies change drastically (Barker et al., 1991).

F. Future prospects: former socialist economies

190. For the former socialist economies of the former Soviet Union and Eastern Europe, long-term sustained gradual reductions in military expenditures in conditions of economic expansion and high rates of investment with government policies of directing output and employment to civilian uses would lead to low costs, a short transition time, and high benefits, and thus a high return from disarmament, as occurred, for example, in the Soviet Union in the period after the Second World War. By contrast, abrupt and precipitous declines in military expenditures in conditions of economic crisis would lead to high costs, a long transition time, and low benefits and thus a low (or even negative) return from disarmament, as in the former Soviet Union today, where these adverse economic conditions are compounded by the lack of both central planning and markets and continued wasteful State support of defence industries and personnel. It will require an unusual combination of focused national economic policy and technical assistance from other countries and international economic organizations to foster the creation of the relevant labour, capital, and other markets and to create the appropriate market conditions for the reallocation of resources released by reduced military spending so as to avoid disastrous consequences and to reap the benefits of disarmament (ILO, 1990).

G. Future prospects: developing economies

191. For the developing economies of the South, long-term sustained gradual reductions of military expenditures in the Middle East, South Asia and other regions, when undertaken in conditions of economic expansion and high rates of investment stemming from high prices of exports, especially oil, foreign assistance, and good macroeconomic policies would lead to low costs, a short transition time and high benefits, and thus a high return from disarmament. By contrast, abrupt and precipitous declines in military expenditures, when combined with conditions of economic decline stemming from low prices of exports, reduced foreign assistance and poor macroeconomic policies would lead to high costs, a long transition period, low benefits, and thus a low (or even negative) return from disarmament. This may be the case in several such countries today, unless countered by international technical and financial assistance and informed national macroeconomic, trade and defence economic policies. In the developing countries, though, the prospects of achieving a peace dividend might be improved because they probably have smaller stocks of military capital and relatively greater flows of resources into and out of the military sector.

H. Conclusion

192. The international community has to face the challenge of maintaining peace over the long run, avoiding future arms races and rearmaments. Long periods of peace and disarmament offer massive economic benefits. A modest 10 per cent across-the-board reduction in world military spending would save

$95 billion per annum, based on 1990 expenditures. A 20 per cent cut in military spending, in the industrialized nations only, would save some $160 billion per annum (1990 base: see chap. III). Of course, in the short run, part of these reductions in defence spending will be needed to fund new investment in labour and capital to facilitate adjustment and the reallocation of resources.

193. In all three major world regions - industrialized market economy, former socialist and developing - there are substantial economic benefits that could be achieved as a result of disarmament, but only if appropriate public policies are pursued, particularly at the national level. In effect, public policy can make a major contribution to minimizing the adjustment and conversion costs, so helping to maximize the eventual benefits of disarmament.

XI. THE ROLE OF PUBLIC POLICIES

A. Introduction: the key issues

194. Public policies are needed to assist economic adjustment. Such policies can be justified on at least two grounds. First, defence expenditure is provided by Governments which are major buyers of both labour and capital, so that Governments are inevitably involved in the adjustment process. Second, public policies are capable of promoting efficient adjustment to disarmament, thereby minimizing both the costs and time involved in the transition. Without an appropriate public policy, the adjustment process might be long and painful.

195. Various public policies are available and their use will vary between different types of economies. Not all public policies are appropriate for assisting a reallocation of resources from defence to civil activities. Some policies can actually hinder the adjustment process, while some policy options might not be feasible in some countries. For example, policies appropriate to industrialized market economies will not be applicable to countries which lack a well-developed market system. More generally, the information base for formulating public policies might not be adequate.

B. The need for information and the lessons of experience

196. Problems immediately arise in formulating public policies when there is a lack of adequate information. What is known, what is not known and what do Governments need to know for making informed public choices in this area? There are few published data on the size, employment, skill composition, structure, degree of diversification, competitiveness and location of the world's defence industries and firms. For example, what is a defence contractor, what is the network of supplier relationships with prime contractors, how dependent are suppliers on defence contracts, which type of skills are employed by which firms, how marketable are the skills, and how important are defence suppliers and subcontractors in their local labour markets? There is also a lack of information on how easily and quickly different types of defence contractors can switch resources from their traditional defence business to new markets. Often firms have production facilities and workforces which can be used interchangeably between defence and civil contracts (e.g., castings, forgings, aerospace). Similar published information is lacking on the world's defence facilities, their location and regional importance and on the skill composition of the world's military manpower.

197. Even though information might be limited, there are useful lessons from previous experience. Case studies, for example, show that some proposals for converting industrial capacity from military to civil work (examples have included tank factories producing tractors; aerospace factories producing

stainless steel teapots and subway cars) often reflect the triumph of hope over experience. The conversion efforts of major defence contractors have rarely been successful (see chap. IX).

198. There is also considerable experience of private firms in civil markets in Western economies adjusting successfully to changes in their traditional markets without needing any government support. Examples include the adjustments to the oil price rises of the 1970s and the response of the United Kingdom tobacco industry to a decline in its traditional markets, which involved diversification into insurance, engineering, hotels, retailing etc. (Hartley et al., 1990). On the other hand, there are cases of firms, industries and communities in Western economies that have not survived change, such as the coal, shipbuilding, steel and textile industries; as well as cases where Governments have not been successful at picking winners (e.g., Concorde). For example, Governments in the European Community faced with job losses and unemployment due to industrial and regional decline have adopted a variety of industrial, manpower, technology and regional policies (Hartley and Tisdell, 1981, chaps. 10, 11 and 15). The results provide a wealth of experience about the efficiency of different policy measures. Some policies relating to civil industries failed because they were protectionist, thereby preventing socially desirable change and resource reallocation (e.g., subsidies to preserve inefficient firms).

C. The range of adjustment policies

199. A variety of public policies are available for assisting an economy to adjust to disarmament. These policies can be classified and organized around the economic concept of the production function. On this basis, the output of goods and services in an economy is the result of applying various inputs, namely, labour, capital, land and technology. The approach is used in table 12 which shows a range of possible policy options, with supporting examples which Governments might or might not adopt.

200. In assessing various adjustment policies, a distinction needs to be made between public policies that assist a reallocation of resources from the declining defence sector to civilian industries and other sectors of the economy and policies that prevent change and resource reallocation. State subsidies are a good example. Subsidies for labour re-training, occupational guidance and geographical mobility are methods of promoting a necessary re-allocation of labour resources. In contrast, subsidies which support inefficient firms and are used to preserve the defence industrial base will prevent socially desirable adjustment and could represent a waste of resources. After all, the peace dividend cannot be obtained without a shift of resources from the defence sector to produce a greater output of civil goods and services.

Table 12. Policy options

Type of policy	Examples
Manpower policy	Training Retraining of managers and workers Job information Labour mobility Early retirement
Capital policy	Retooling old plant and equipment Investing in new plant and equipment Producing new consumer goods
Science and technology policy	Use of scientists and engineers New civil research and development programmes, e.g., energy; environment; space exploration
National regional policy	Location of industry policy
Social infrastructure policy	Building airports, roads and expanding telecommunications
Industry policy	Subsidies to civil research and development Subsidies to labour and/or capital Government contracts for civil goods
State conversion agency	Aiming to assist the conversion of plants from defence to civil markets
Aggregate demand policy	Using government expenditure to avoid recessions
International trade policy	Support for exports and import saving
Income deficiency payments	Aimed at compensating the losers from disarmament; e.g., unemployment pay and redundancy pay (social safety net)
International action	Role for international agencies in disseminating information and experience on adjustment

201. In all economies, the major focus of adjustment is likely to be on how well and how quickly labour markets operate. There are, though, differences between types of economies. In industrialized market economies, labour markets provide price signals (wages and salaries) allocating manpower between different skills, different industries and different sectors in an economy. For such economies, a reduced demand for manpower in the armed forces and defence industries will be reflected in job losses and relatively unattractive employment and future income prospects. These changes will affect not only the existing stock of workers but also the future flow of new entrants. Faced with future defence cuts, school leavers and graduates will undertake training for more attractive alternative occupations in the civil sector. But, of course, there are a variety of labour markets in industrialized market economies, each for different skills, industries and locations, and they can differ in how well they might work. A satisfactory position in the aggregate labour market might conceal major adjustment problems in a particular town dependent on a defence contractor or on a military base faced with closure. In these circumstances, public policies might aim to improve the operation of local labour markets through manpower policies embracing training, retraining, job information and labour mobility.

202. Labour, though, is only one input into the production process. Capital, land and technology also contribute to the production of goods and services. Once again, in industrialized market economies, market price signals will reallocate resources from defence to the civilian sectors. But left to themselves, private markets might fail to work properly. In such circumstances, public policies can improve the operation of markets, through, for example, assisting the reallocation of capital (plant and equipment) to alternative civilian uses, some of which might necessitate moving to another region.

203. In centrally planned economies, a command system reallocates resources from defence to civil uses. For example, the central plan might require labour and capital to move out of the production of ballistic missiles into the manufacture of consumer durables, such as washing machines, television sets and refrigerators (see chap. IX). However, problems arise for the economies of Eastern Europe and the former USSR where an adequate system of properly working markets has not yet been established to replace the original centrally planned command system. Such economies will lack the appropriate markets for reallocating the resources released by reduced defence spending. As a result, there are real prospects of a costly and painful adjustment process and a failure to reap the potential benefits of disarmament. To avoid such consequences will require an unusual combination of national economic policies and technical advice and assistance from other countries and international economic organizations.

204. In market economies, a Government might also adopt public policies which focus on an active industrial strategy and regional policy. For example, it might believe that market forces will be dominated by short-term profitability criteria which might not be in the national interest. As a result, a Government might intervene directly in firms' investment and location

decisions and it could subsidize jobs, high technology (research and development), export activities and key industries as part of its concern with protecting the national interest. In some cases, an interventionist State agency might be created to change industrial structure, for example, by promoting rationalization or mergers, or to change ownership, whereby private firms could be taken into State ownership to ensure that they acted in the public interest.

205. For declining defence industries in market economies, an active interventionist approach might be reflected in a regional policy of taking work to the workers, aimed at introducing new employment opportunities into areas vulnerable to defence cuts. Alternatively, defence firms facing closure could be awarded government contracts for civil high technology projects, such as new transit systems, a new supersonic airliner, or exploration of the seas and space. Another policy option is the creation of a State diversification agency with the specific task of helping defence contractors to obtain new civil markets. Once again, though, questions arise about how well these and other public policies hinder or prevent change, and whether they assist the reallocation of resources and minimize the adjustment costs of disarmament.

206. In the transitional economies of Eastern Europe and the former USSR, Governments face similar difficult choices about the conversion of their defence industries. One option would be to pay the defence industry workforce to do nothing; but this policy would prevent the required reallocation of resources. Another option would be for the Government to buy the output of its defence industry and either store it or sell it in export markets. Once again, this would not promote the necessary reallocation of resources out of the defence sector and, in the case of exports, it might lead to regional arms races. A third option, which would assist adjustment and lead to the economic benefits of disarmament, would be for the Government to retrain the workers and re-equip the plant to enable it to manufacture civil products whenever this is possible (Wiseman, 1991).

207. The previously closed military cities of the former USSR, which were wholly dependent on military spending, are also faced with major problems in adjusting to disarmament. Such cities lack a broadly-based, diversified local economy. Public policy could aim to locate new industries in these cities or assist workers to retrain and move to other regions. The worry is that in the transition from a centrally planned to a market economy, an abrupt and major reduction in military spending under conditions of economic crisis will not be conducive to the introduction of well-managed and appropriate adjustment policies.

D. Conclusion: some guidelines for adjustment policy

208. Appropriate adjustment policies are designed to minimize the costs and time involved as the resources released from defence are reallocated to the civilian economy. For all types of economies faced with disarmament, there are some guidelines for public policies on adjustment:

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(a) Major and rapid reductions in defence spending in recessionary conditions of falling output and large-scale unemployment with relatively small sums available for retraining and reinvesting in new plant and equipment are likely to contribute to high adjustment and conversion costs, a long transition time and low conversion benefits resulting in a low return from disarmament;

(b) Certain types of public policies might actually hinder or prevent a socially desirable reallocation of resources. Some subsidies in market and transitional economies are a good example, where they can be used to preserve the existing pattern of resource allocation (e.g., subsidies to support declining industries). However, where subsidies are used to reallocate resources as part of disarmament (e.g., retraining or related to exports), they should not be penalized by international trade policy;

(c) Long-term gradual reductions in defence spending under conditions of economic expansion with supportive government policies for new investment and for retraining military personnel and defence workers for the civilian economy offers the potential for a high return from disarmament. This potential exists in all types of economies, where the aim of public policies would be to minimize adjustment costs and time, and to maximize the benefits of disarmament, so resulting in a high rate of return from disarmament.

APPENDIX

Defence economics

A. A new discipline

Interest in the field

1. Within economics, a number of specialized fields have been established such as monetary economics, growth, international trade, industrial organization, labour and public finance. Recent additions have included environmental economics, health economics and public choice. Defence economics is a relatively new specialism within the subject area of economics. It involves the application of economic principles to defence, disarmament and peace. Compared with other branches of economics, this is a new and relatively under-researched field.

2. Interest in the field is not surprising. In most countries, defence is a major user of scarce resources and as such it raises opportunity cost issues that are at the centre of economics. Important though the field is in terms of both resource use and the future of civilization, it is none the less significant that the field has attracted relatively few economists. Other areas of economics have been the focus of much of the profession's attention such as macroeconomics and general equilibrium theory. This pattern of resource allocation by economists reflects the set of incentives in their labour market. Economists will be attracted to certain specialist fields by promotion opportunities, by professional prestige, esteem and norms (conventional wisdom), by data availability, by research funds and by the search costs needed to obtain a knowledge of the market.

Aspects of defence economics

3. The subject area of defence economics can be defined broadly to embrace all aspects of the economics of defence, disarmament and peace. Examples include peace and war economics, arms races, alliances, burden-sharing, terrorism, arms limitation agreements, verification, disarmament and economic conversion. It studies the economic impact of military spending in developed and developing countries, the impact of defence research and development, weapons procurement policies, defence industries and the arms trade.

4. Further issues focus on the efficient management of defence resources involving budgeting (e.g., programme budgets), internal markets in the armed forces, the military production function, the possibilities of substitution between capital and labour (equipment versus manpower), the role of employment contracts, military manpower, conscription versus an all-volunteer force, recruitment, training and retention. Not surprisingly, these are all topics to which economists can apply their standard "tool kit". Work in the field has involved economists in theoretical, empirical and policy contributions. The table provides a schema which places disarmament and arms limitation in its broader context.

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Areas of defence economics*

A. Macroeconomics: developed and developing countries

1. Determinants of defence spending
2. Burdens and benefits of expenditure (including trade-offs)
3. Growth and development
4. Country studies

B. International trade: arms trade

C. Alliances: international public goods

D. Microeconomics: demand and supply

1. Features of defence markets (public goods)
2. Procurement
3. Contract types
4. Defence industries
5. Research and development
6. Procurement options (e.g., importing; collaboration)
7. Regional impacts
8. Case-studies (industry and project case-studies)
9. Labour markets:
    (a) Employment in defence industries
    (b) Military manpower: recruitment, training, retention

E. Disarmament, conversion and peace

1. Causes of war
2. Arms race models
3. Arms limitation
4. Disarmament
5. Conversion
6. Adjustment costs

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* Areas covered in the present report include A. 1-3; B; D. 1, 4, 5, 7, 9; and E.

B. A research agenda

Disarmament and arms limitation is a challenge to economists. There are a variety of research questions on the economic aspects of disarmament. Examples are:

(a) What have been the causes of the decline in worldwide military expenditure since 1987? What have been the causes of declines in particular regions and in specific countries?

(b) What are the effects of disarmament on employment and unemployment within a country, within a region and globally? What are the particular effects on former military personnel, on former defence plant workers, and on other groups of workers? What are the effects on labour in specific defence industries? What are the regional impacts? Which public policies might offset the adverse employment and unemployment effects of disarmament?

(c) What are the effects of disarmament on capital utilization, capital formation, and capital productivity within a country, within a region and globally? What are the particular effects on former defence installations (army, air force and navy bases), on plants formerly producing armaments, and other capital? What are the effects on particular regions? Which public policies might offset the adverse effects of disarmament on capital utilization, capital formation and capital productivity?

(d) What are the characteristics needed for the successful conversion of defence facilities and plants from military to civil activities?

(e) For the former Soviet Union and other States that are moving from a centrally planned economy to a market economy, will conversion from military to civilian production create more difficult problems? What are the possibilities for international solutions to these problems?

(f) Does the production of arms for export offset the economic effects of reduced production for domestic use? What are the economic effects of arms exports on the balance of payments, employment and technology?

(g) What have been the historical economic effects of past disarmament situations, including the end of both World Wars and other major recent wars, including the Persian Gulf war, the Iran-Iraq war, the Afghanistan war, the Viet Nam war, and the Korean war? What are the similarities and the differences between the economic effects of disarmament after a war has been fought and the economic effects of disarmament without a war having been fought, as at the end of the cold war?

(h) How can various economic models such as simulation methods, cost-benefit analysis, input-output models, and other methodologies be used to study and quantify the economic effects of disarmament? What are the strengths and weaknesses of each methodology? Can an eclectic methodology be developed which combines the best features of each?

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BIBLIOGRAPHY

A. Sources

A variety of sources of published data are available on military expenditure, arms production, the international arms trade and the armed forces. Some of the major sources of data are:

Financial and Economic Data Relating to NATO Defence Expenditure. Brussels, NATO.

Government Finance Statistics Yearbook. Washington, D.C., IMF.

Jane's Yearbooks: All The World's Aircraft; Armour and Artillery; Avionics; Fighting Ships; Infantry Weapons; Military Communications; Military Vehicles and Ground Support Equipment; Weapons Systems. London, Jane's Publishing Company.

Statistical Yearbook. New York, United Nations.

Sivard, R. L. World Military and Social Expenditures. Washington, D.C.

SIPRI Yearbook, World Armaments and Disarmament. Stockholm International Peace Research Institute.

The Military Balance. London, International Institute for Strategic Studies.

World Military Expenditures and Arms Transfers. Washington, D.C., US Arms Control and Disarmament Agency.

B. Journals and bibliographies

Relevant journals include:

Defence Economics; the Journal of Conflict Resolution; and the Journal of Peace Research.

For an annotated bibliography of relevant literature, see:

Hartley, K. and N. Hooper. The Economics of Defence, Disarmament and Peace. Aldershot, Elgar, 1990.

See also Bibliographical Survey of Secondary Literature on Military Expenditures, UNIDIR Research Paper No. 6, 1989; UNIDIR Newsletter, vol. 1, No. 1 (March 1988); and Relationship between Disarmament and Development: A Bibliographical Survey of Recent Literature. 7 February 1986 (43 p.) and 3 April 1987 (12 p.) (A/CONF.130/PC/INF.4 and Corr.1 and Add.1).

/...

C. Selected references

Aben, J., Désarmement, activité et emploi. Défense Nationale, vol. 37. Paris, Comité d'Etudes de Défense Nationale, May 1981, pp. 105-125.

ACDA. World Military Expenditures and Arms Transfers. Washington, D.C., US Arms Control and Disarmament Agency, 1990.

ACOST. Defence Research and Development: A National Resource. London, Advisory Council on Science and Technology. HMSO, 1989.

Albrecht, U. New concepts for conversion strategies in Western Europe: analysing the Lucas experience. Bulletin of Peace Proposals, vol. 9, No. 4, 1978, pp. 348-358.

Alexander, W. R. J. The impact of defence spending on economic growth. Defence Economics, vol. 2, No. 1, 1990, pp. 39-55.

Anthony, I. et al. West European Arms Production. Stockholm, SIPRI, 1990.

Arad, R. et al. The Economics of Peacemaking: Focus on the Egyptian-Israeli Situation. London, Macmillan, 1983.

Atesoglu, H. S. and M. J. Mueller. Defence spending and economic growth. Defence Economics, vol. 2, No. 1, 1990, pp. 19-27.

Balgovolin, S. Voennaya Moshch - skolko, kakaya zachem. Mirovaya Ekonomika i Mezhdunarodnye Otnosheniya, No. 8, 1989, pp. 5-9.

Ball, N. Converting Military Facilities. Geneva, ILO, 1985.

Barker, T., P. Dunne and R. Smith. The peace dividend in the UK. Journal of Peace Research, vol. 28, No. 4, November 1991, pp. 337-358.

Benoit, E., Defence and Economic Growth in Developing Countries. Lexington, Massachusetts, Lexington Books, D. C. Heath, 1973.

Benoit, E. and K. Boulding, eds. Disarmament and the Economy. New York, Harper and Row, 1963.

Berger, M. C. and B. T. Hirsch. The civilian earnings experience of Vietnam-era veterans. Journal of Human Resources, vol. 18, No. 4, Fall 1983, pp. 453-479.

Bishak, G. A. Towards a Peace Economy in the United States. London, Macmillan, 1991.

Bremen, S. and B. Hughes. Disarmament and Development: A Design for the Future? Englewood Cliffs, New Jersey, Prentice Hall, 1990.

/...

Bougrov, E. Kongseptualnje i praktucheskje aspekti konversii. Mirovaya Ekonomika i Mezhdunarodnye Otnosheniya, No. 6, 1989, pp. 20-36.

Brito, D. L. and M. D. Intriligator. Strategic arms limitation treaties and innovations in weapons technology. Public Choice, vol. 37, No. 1, 1981, pp. 41-59.

Browning, H. L., S. C. Lopreato, and D. L. Poston, Jr. Income and veteran status: variations among Mexican Americans, Blacks and Anglos. American Sociological Review, vol. 38, February 1973, pp. 74-85.

Cars, H. C. and J. Fontanel. Military expenditure comparisons. In C. Schmidt, and F. Blackaby, eds., Peace, Defence and Economic Analysis. London, Macmillan, 1987.

Chan, S. and A. Mintz. Defence, Welfare and Growth. Boston, Unwin & Hyman, 1991.

Chatterji, M. and J. Brauer, eds. Economic Issues of Disarmament. New York, New York University Press, 1991.

Deger, S. Military Expenditure in Third World Countries: The Economic Effects. London, Routledge, 1986.

Deger, S. and S. Sen. Military Expenditure. The Political Economy of International Security. SIPRI. Oxford, Oxford University Press, 1990a.

Deger, S. and S. Sen. Military security and the economy: defence expenditure in India and Pakistan. In K. Hartley and T. Sandler, eds., The Economics of Defence Spending, pp. 189-227, London, Routledge, 1990b.

Deger, S. and R. Smith. Military expenditure and growth in less developed countries. Journal of Conflict Resolution, vol. 27, No. 2, June 1983, pp. 335-353.

Deger, S. and R. West, eds., Defence, Security and Development. London, Frances Pinter, 1987.

De Grasse, R. W. Military Expansion, Economic Decline: The Impact of Military Spending on US Economic Performance. Armonk, New York, Sharpe, M. E. 1983.

De Haan, H. Military expenditures and economic growth. In C. Schmidt, ed., The Economics of Military Expenditures, pp. 87-97. London, Macmillan, 1987.

Dumas, L. J. The Political Economy of Arms Reduction. Boulder, Colorado, Westview Press, 1982.

Dumas, L. J. The Overburdened Economy. Berkeley, California, University of California Press, 1986.

/...

Dumas, L. and M. Thee, eds., Making Peace Possible: The Premise of Economic Conversion. New York, Pergamon, 1989.

Dunne, P. and R. Smith. The economic consequences of reduced UK military expenditure. Cambridge Journal of Economics, vol. 8, No. 3, September 1984, pp. 297-310.

Dunne, P. and R. Smith. Military expenditure and unemployment in the OECD. Defence Economics, vol. 1, No. 1, 1990a, pp. 74-75.

Dunne, P. and R. Smith. The peace dividend and the UK economy. Cambridge Econometrics, Report No. 1, Spring 1990, pp. 47-61 (1990b).

Dussauge, P. The conversion of military activities. In F. Blackaby and C. Schmidt, eds., Peace, Defence and Economic Analysis. London, Macmillan, 1987.

Faramazian, R. A. The Arms Race and Conversion from Military to Civilian Economy. Moscow, Nauka, 1985.

Fontanel, J. L'économie du désarmement: dix conseils pratiques. Arès, vol. XIII, No. 1, avril 1992, pp. 83-92.

Fontanel, J. Les technologies militaires et le développement économique contemporain. In J. Fontanel and J. F. Guilhaudis, eds., La Vérification du désarmement. Grenoble, Arès, 1989, pp. 93-110.

Fontanel, J. and J. Aben. Economie de la Défense. Arès, vol. XII, No. 4, 1991. 145 p.

Fontanel, J. and J. F. Guilhaudis. Le désarmement pour le développement. Grenoble, Arès, 1986. 412 p.

Fontanel, J. and J. Saraiva. Les industries d'armement comme vecteur du développement économique des pays du tiers-monde. Paris, Institut français de polémologie, 1986.

Fontanel, J. and M. Ward. Les exportations d'armes et la croissance économique: L'exemple de la France. In J. Fontanel and J. Aben, eds., Développement économique et défense. Arès, vol. XII, No. 4, décembre 1991, pp. 86-98.

Fontanel, J., A. Humm and R. Smith. The economics of exporting arms. Journal of Peace Research, vol. 22, No. 3, 1985, pp. 239-247.

Galbraith, J. K. The New Industrial State. London, Hamish Hamilton, 1967.

Gandhi, V. P. India's self-inflicted defence burden. Economic and Political Weekly, 31 August 1974.

/...

Gold, D. and G. Adams. Defence spending and the American economy. Defence Economics, vol. 1, No. 4, 1990, pp. 275-294.

Gonchar, K. Eto Trudnoje Delo Ekonomika Razoruzheniya. Kommunist, No. 9, 1990, pp. 97-106.

Hartley, K. Reducing defence expenditure: a public choice analysis and a case study of the UK. In C. Schmidt and F. Blackaby, eds., Peace, Defence and Economic Analysis. London, Macmillan, 1987.

Hartley, K. Les industries de défense; l'ajustement aux changement. In Economie de la défense. Arès, vol. XII, décembre 1990, pp. 71-85.

Hartley, K., The Economics of Defence Policy. London, Brasseys, 1991a.

Hartley, K. Comments on Robert McNamara. Proceedings of the World Bank Annual Conference on Development Economics. Washington, D.C., 1991b, pp. 127-130.

Hartley, K. and N. Hooper. The Economic Consequences of the UK Government Decision on the Chieftain Replacement. Research Monograph, Series 1. Centre for Defence Economics, University of York, 1990a.

Hartley, K. and N. Hooper. The Economics of Defence, Disarmament and Peace: An Annotated Bibliography. Aldershot, Elgar, 1990b.

Hartley, K. and N. Hooper. UK defence and dependence: economic burden or benefit. In J. Hutton et al., eds., Dependency to Enterprise. London, Routledge, 1991.

Hartley. K. and J. Singleton. Defence research and development and crowding-out. Science and Public Policy, vol. 17, No. 3, June 1990, pp. 152-156.

Hartley, K. and C. Tisdell. Micro-Economic Policy. London, Wiley, 1981.

Hartley, K. et al. Industry: structure, performance and policy. In A. Maynard and P. Tether, eds., Preventing Alcohol and Tobacco Problems, vol. 1, Aldershot, Avebury, 1990.

Hewitt, D. P. Military Expenditure: International Comparison of Funds. IMF Working Paper. Washington, D.C., 1991 (WP/91/54).

Hitch, C. J. and R. N. McKean. The Economics of Defence in the Nuclear Age. Cambridge, Massachusetts, Harvard University Press, 1960.

Hutton, J. et al., eds. Dependency to Enterprise. London, Routledge, 1991.

Klein, L. R. Disarmament and socio-economic development. Disarmament, vol. IX, No. 1, New York, United Nations, Spring 1986, pp. 49-63.

/...

ILO. Disarmament and Employment Programme, Part I. Problems of Conversion from Military to Civilian Production following the Soviet-US Treaty on the Elimination of Intermediate and Short Range Nuclear Forces: Example of the Votkinsk Plant, Working Paper No. 16. Geneva, International Labour Office, 1990.

Intriligator, M. D. On the nature and scope of defence economics. Defence Economics, vol. 1, No. 1, 1990, pp. 3-11.

Intriligator, M. and D. Brito. Can arms races lead to the outbreak of war? Journal of Conflict Resolution, vol. 28, No. 1, March 1984, pp. 63-84.

Isard, W. Arms Races, Arms Control and Conflict Analysis: Contributions from Peace Science and Peace Economics. Cambridge Massachusetts, Cambridge University Press, 1988.

Izyumov A., Konversiya i perechod k rinku. Voprosy Ekonomiki, No. 2, 1991, pp. 30-36.

Kaldor, M. et al. Industrial competitiveness and Britain's defence. Lloyds Bank Review, vol. 162, October 1986, pp. 31-49.

Kennedy, G. Defence Economics. London, Duckworth, 1983.

Kennedy, P. The Rise and Fall of the Great Powers. London, Fontana Press, 1988.

Kinsella, D. Defence spending and economic performance in the United States. Defence Economics, vol. 1, No. 4, 1990, pp. 295-310.

Kirby, S. and N. Hooper, eds. The Cost of Peace: Assessing Europe's Security Options. Reading, Harwood, 1991.

Klein, L. R. Disarmament and development. In J. J. Salomon, ed., Science, War and Peace. Paris, Economica, 1990.

Klein, L. R. and K. Mori. The impact of disarmament on aggregate economic activity: an econometric analysis. In B. Udis, ed., The Economic Consequences of Reduced Military Spending, London, Lexington, 1973, pp. 59-78.

Leontief, W. and F. Duchin. Military Spending. Oxford, Oxford University Press, 1983.

Lynch, J. E., ed. Economic Adjustment and Conversion of Defence Industries. Boulder, Colorado, Westview Press, 1987.

McNamara, R. S. The Post Cold-War World: Implications for military expenditure in the developing countries. Annual Conference on Development Economics. Washington, D.C., World Bank, 1991, pp. 95-140.

/...

Melman, S., ed. Disarmament: Its Politics and Economics. Boston, American Academy of Arts and Sciences, 1962.

Melman, S. Conversion of Industry from a Military to a Civilian Economy, New York, Praeger, 1970.

Melman, S. Economic consequences of the arms race. American Economic Review, vol. 78, No. 2, May 1988, pp. 55-59.

Mosley, H. G. The Arms Race: Economic and Social Consequences. Lexington, Lexington Books, 1985.

Murdoch, J. and T. Sandler. A theoretical and empirical analysis of NATO. Journal of Conflict Resolution, vol. 26, No. 2, June 1982, pp. 237-263.

Nadal, A. Arsenales Nucleares: Technologia decadente y control de armamentos. Mexico, El Colegio de Mexico, 1991.

Olson, M. and R. Zeckhauser. An economic theory of alliances. Review of Economics and Statistics, vol. 48, August 1966, pp. 266-279.

Paukert, L. and P. Richards, eds. Defence Expenditure, Industrial Conversion and Local Employment. Geneva, ILO, 1991.

Peck, M. J. and F. M. Scherer. The Weapons Acquisition Process: An Economic Analysis. Boston, Harvard University Press, 1962.

POST. Future Relations Between Defence and Civil Science and Technology. London, Parliamentary Office of Science and Technology, Science Policy Support Group, 1991.

Pugh, P. The Cost of Sea Power. London, Conway, 1986.

Pursell, C. W., ed. The Military-Industrial Complex. New York, Harper and Row, 1972. Includes President Eisenhower's farewell address.

Renner, M. Economic Adjustment After the Cold War. UNIDIR publication. Aldershot, Dartmouth, 1991.

Richards, P. J. Disarmament and employment. Defence Economics, vol. 2, No. 4, 1990, pp. 295-312.

Richardson, L. F. Arms and Insecurity: A Mathematical Study of the Causes and Origins of War. Pittsburgh, Boxwood Press, 1960.

Russett, B. M. What Price Vigilance? The Burdens of National Defense. New Haven, Connecticut, Yale University Press, 1970.

Salomon, J. J., Science, Guerre et Paix. Paris, Economica, 1989.

/...

Sapir, J. URSS: La conversion de l'industrie militaire vers le secteur civil. Information et Commentaires, 68, juillet-septembre 1989.

Schelling, T. C. Arms and Influence. New Haven, Connecticut, Yale University Press, 1966.

Scherer, F. M. The Weapons Acquisition Process: Economic Incentives. Boston, Harvard University Press, 1964.

Schmidt, H. Facing One World. Report by an Independent Group on Financial Flows to Developing Countries. Bonn, June 1989.

Sharp, J., ed. Europe After An American Withdrawal. SIPRI. Oxford, Oxford University Press, 1990.

Smith, D. and R. Smith. The Economics of Militarism. London, Pluto, 1983.

Smith, R. Military expenditure and capitalism. Cambridge Journal of Economics, vol. 1, No. 1, March 1977, pp. 61-76.

Smith, R. Military expenditure and investment in OECD countries, 1954-1973. Journal of Comparative Economics, vol. 4, March 1980, pp. 19-32.

Southwood, P. Disarming Military Industries. London, Macmillan, 1991.

Stockholm International Peace Research Institute. World Armaments and Disarmament. Stockholm, 1991.

Subrahmanyam, K. Planning and defence. In P. Streeten and M. Lipton, eds., The Crisis of Indian Planning, pp. 351-378. Oxford, Oxford University Press, 1968.

Sur, S., ed. Verification of Current Disarmament and Arms Limitation Agreements: Ways, Means and Practices. UNIDIR publication. Aldershot, Dartmouth, 1991a.

Sur, S. 1991 (ed), Disarmament Agreements and Negotiations: The Economic Dimension. UNIDIR publication, Dartmouth, Aldershot, 1991b .

Sur, S., ed. Verification of Disarmament or Limitation of Armaments: Instruments, Negotiations, Proposals. UNIDIR publication. New York, United Nations, 1992.

Terhal, P. Guns or grains: macroeconomic costs of Indian defence 1960-70. Economic and Political Weekly, vol. XVI, No. 4, 5 December 1981, pp. 1995-2004.

Thee, M. Science and Technology: Between Civilian and Military Research and Development. UNIDIR. Research Papers 7. New York, United Nations, 1990.

United Kingdom, Statement on the Defence Estimates, 1987, vol. 1, Cmnd. 101. London, HMSO, 1987. See also Statement on the Defence Estimates, 1991. Cmnd. 1559. London, HMSO, 1991.

United States Congressional Budget Office. US Costs of Verification and Compliance under Pending Arms Treaties. Washington, D.C., September 1990.

United States Congressional Budget Office. The START Treaty and Beyond. Washington, D.C., October 1991.

United States Congressional Budget Office. The Economic Effects of Reduced Defence Spending. Washington, D.C., 1992.

United States Senate. Hearings on the B-2 bomber programme. Washington, D.C., October 1990.

Vayrynen, R. Military Industrialization and Economic Development: Theory and Historical Case Studies. UNIDIR publication, Aldershot, Dartmouth, 1992.

Weidenbaum, M. Defence spending and the American economy: how much change is in the offing? Defence Economics, vol. 1, No. 3, 1990, pp. 233-242.

Willett, S. Controlling the Arms Trade. Faraday Discussion Paper 18. Council for Arms Control. London, University of London, 1991.

Wiseman, J. Privatization in the command economy. In A. Ott and K. Hartley, eds., Privatization and Economic Efficiency, Aldershot, Elgar, 1991.

Wolfson, M. Essays on the Cold War. London, Macmillan, 1992.

D. United Nations documents

Reduction of military budgets

Reduction of the Military Budgets of States Permanent Members of the Security Council by 10 per cent and Utilization of Part of the Funds Thus Saved to Provide Assistance to Developing Countries (A/9770/Rev.1). United Nations publication, Sales No. E.75.I.10.

Reduction of Military Budgets: Measurement and International Reporting of Military Expenditures (A/31/222/Rev.1). United Nations publication, Sales No. E.77.I.6.

Reduction of Military Budgets: International Reporting of Military Expenditures (A/35/479). United Nations publication, Sales No. E.81.I.9.

Reduction of Military Budgets: Refinement of International Reporting and Comparison of Military Expenditures (A/S-12/7). United Nations publication, Sales No. E.83.IX.4.

Reduction of Military Budgets: Construction of Military Price Indexes and Purchasing-power Parities for Comparison of Military Expenditures (A/40/421). United Nations publication, Sales No. E.86.IX.2.

Economic and social consequences of the arms race

Economic and Social Consequences of the Arms Race and Military Expenditures (A/37/386). United Nations publication, Sales No. E.83.IX.2.

Study on the Economic and Social Consequences of the Arms Race and Military Expenditures (A/43/368). United Nations publication, Sales No. E.89.IX.2.

Other documents

Centre for Science and Technology for Development. *Conversion: Opportunities for Development and Environment*. Conference report, Dortmund, 24-27 February 1992. New York, 1992.

Conference on Disarmament. Communiqués issued following the meetings of the five permanent members of the Security Council on arms transfers and non-proliferation, held in Paris on 8 and 9 July 1991 (CD/1103) and in London on 17 and 18 October 1991 (CD/1113).

___________. Background paper containing a list of United Nations documents relevant to General Assembly resolution 46/36 L, on transparency in disarmament.

General Assembly. Study on ways and means of promoting transparency in international transfers of conventional arms: report of the Secretary-General. 9 September 1991 (A/46/301).

United Nations Conference on Trade and Development (UNCTAD). *A New Partnership for Development: The Cartagena Commitment*. Geneva, UNCTAD, April 1992.

United Nations Development Programme (UNDP). *Human Development Report 1992*. Oxford, Oxford University Press, 1992.

UNIDIR. *Establishment of an International Disarmament Fund for Development*. Geneva, UNIDIR, 1984.

UNIDIR. *Disarmament and Development: Some Practical Suggestions to Bypass the Present Deadlock*, by Nicole Gnesotto. Geneva, UNIDIR, 1987.

UNIDIR. Disarmament and Development. *UNIDIR Newsletter*, vol. 1, No. 1, March-April 1988.

UNIDIR. *Bibliographical Survey of Secondary Literature on Military Expenditures*. UNIDIR Research Papers No. 6. New York, 1989.

Other relevant UNIDIR publications are listed in section C above.
